

ARCADIS Avantic

SP

Replacements of Parts

System

Replacement of Parts:

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Required documents

- ARCADIS Avantic wiring diagram
- For the laser targeting device as applicable: Adjustment instructions/laser targeting device SPR2-330.815.02...

Required tools, measurement devices, and accessories

NOTE

All tools, measurement devices and aids with the exception of those marked “*”, are listed along with their specifications in the STC (Service Tools Catalog).

- Standard tool kit*
- Digital multimeter, e.g. Fluke 8060 A Part no. 97 02 101 Y4290
- Oscilloscope > 50 MHz, e.g. Fluke CombiScope PM 3390 A Part no. 99 00 861 Y3155
- Dose measurement device
e. g. DALI PTW* no longer in ARTD
or NOMEX PTW* no longer in ARTD
or DIADOS PTW Part no. 97 17 612 Y0388
- Ground wire test meter
e.g. Unimed 1000 tester Part no. 51 38 727 Y0766
- 1 set of resolution tests e.g. part no. 28 71 820 RE999
- 1 set of radiation filters e.g. part no. 97 98 596 G5321
- Centering cross e.g. part no. 96 60 051 RE999
- WPS heat conducting paste e.g. part no. 20 48 650 SRN 6400
- 200 N spring scale e.g. part no. 44 15 113 RH090
- Torque wrench 20 Nm to 100 Nm e.g. part no. 80 86 159 RE999
- Torque wrench 10 - 80 Ncm (necessary for image rotation adjustment) Part no. 080 79 241
- Loctite 221

- Optimol Viscogen KL 300, 50 ml Part no. 72 79 107
- Sealing compound* Part no. 20 49 716 SRN 6002

Text emphasis



DANGER indicates an immediate danger of death or serious physical injury.

⇒ n.a.



WARNING indicates a danger that may lead to death or serious physical injury.

⇒ n.a.



CAUTION used with the safety alert symbol indicates a risk of minor or moderate physical injury and/or damage to property.

⇒ n.a.



NOTICE used without the safety alert symbol indicates a risk that if disregarded will lead or may lead to a situation which may result in an undesirable result or state other than death, physical injury or damage to property.

⇒ n.a.



NOTE contains information provided with special emphasis to facilitate proper use of the equipment or proper execution of a procedure, i.e. hints, tips.

Symbols



This symbol means “X-ray”, checks and adjustments that must be performed with radiation ON.



This symbol means “Dangerous electrical voltage”, >25V ~ or > 60V _ .



This symbol means “Caution”, general possibility of risk.



This symbol indicates components sensitive to electrostatic discharge (ESD).



This symbol means “Torque Value”, note about a threaded connector.

Safety information

General safety information (in existing documents)



Danger of injuries, death or material damage.

Non-compliance can lead to death, injury or material damage.

Please note:

- ⇒ The product-specific safety notes in these instructions,
 - ⇒ The general safety information in TD00-000.860.01... and
 - ⇒ The safety information in accordance with ARTD Part 2.
-

General electrical safety information



Electrical safety!

Non-compliance can lead to severe injury or even death, as well as material damage.

- ⇒ Parts under electrical voltage are accessible when the covers are open. To avoid danger, disconnect the system from the power supply before opening the covers. Disconnect the power plug.
 - ⇒ If an uninterruptible power supply (UPS) is installed in the system, the voltage output of the UPS must also be deenergized or the voltage output plug must be disconnected.
 - ⇒ If work steps must be performed using electrical power, the general safety information according to TD00-000.860.01 must be observed.
-



Electrical voltage!

Non-compliance can result in material damage.

- ⇒ When working on the system, ESD regulations must be observed.
-

Radiation safety information

 WARNING

X-ray radiation!

Non-compliance can lead to illness, irreversible damage to body cells and the genotype, severe injury and even death.

During work on the system in which radiation must be released, the radiation protection directives and the rules for radiation protection according to ARTD-002.731.02.. must be complied with.

Please note:

- ⇒ Use available radiation protection devices.
- ⇒ Wear radiation protection clothing (lead apron).
- ⇒ Stay as far away as possible from the radiation source.
- ⇒ Release radiation only if necessary.
- ⇒ Set the radiation activity as low as possible. (Low kV and mA values, short radiation time)
- ⇒ Release radiation for as short a time as possible.
- ⇒ Checks requiring the release of radiation are identified by the radiation warning symbol shown on the left.



Mechanical safety information

 CAUTION

Risk of burns from hot parts or components!

If not observed, minor to more severe burns, especially on the hands, can occur.

- ⇒ Parts and components (e.g., power components, cooling fin, electromagnetic brakes) that can exceed 50 degrees Celsius during operation are accessible after the covers are opened. To avoid burns, switch the system off before touching parts or components and allow at least 5 minutes for it to cool down.

⚠ CAUTION**Risk of injury from mechanical parts!**

If not observed, minor to more severe injury, especially to the hands, can occur.

- ⇒ After the covers are opened, parts such as flat plugs, threaded bolts, cut-off cable ties and component edges are exposed, and if care is not taken, they can cause crushing, scrapes and cuts to the skin, particularly to the hands.
 - ⇒ Perform the required work with special care and attention to detail.
 - ⇒ If necessary, wear work gloves.
-

Safety information - risk of infection**⚠ WARNING****Risk of infection due to pathogens!**

Non-compliance can lead to severe injury and even death.

- ⇒ This product can be contaminated with infected blood or other bodily fluids.
 - ⇒ Avoid all contact with blood or other bodily fluids!
 - ⇒ Strictly observe the safety information in ARTD-002.731.37.. regarding prevention of infectious diseases during customer service calls.
-

Laser light localizer option**⚠ CAUTION****Laser emissions!**

This product contains class 2 lasers. (USA: Laser class 2)

Disregarding safety precautions can lead to bodily injury, especially to the retina of the eye, resulting in irreversible damage to vision.

- ⇒ Observe the safety information in ARTD-002.731.03... When working with the laser light localizer, do not look directly into the laser beam.
-

NOTE**Laser emissions!**

There is no direct hazard to the eye (blinking reflex). Nevertheless, do not look directly into the laser beam.

Ground wire resistance test information

Observe the instructions in the "Safety Rules for Installation and Repair" (ARTD-002.731.17 ...).

The ground wire resistance must be measured after every system intervention.

However, documentation of the measured values is required only during periodic safety checks.

If parts/components that can significantly influence the ground wire resistance (e.g. replacement of the power cable, replacement of the power-up module, replacement of multi-pole connection cables, which also create the ground wire connection between system parts (e.g. monitor cable or C-arm cable)) are replaced or if ground wire connections have been repaired, the ground wire resistance must be measured. The values must be documented and assessed in the ground wire resistance protocol.

NOTE

For evaluation purposes, the first measured value and the values documented during maintenance or safety checks must be compared to the measured values. A sudden or unexpected increase in the measured values may indicate a defect in the ground wire connections - even if the limit value of 0.2 ohms is not exceeded. (Ground wire or contacts).

The measurement must be performed according to DIN VDE 0751, Part 1 (see ARTD, Part 2). In this case, the ground wire resistance for all touchable conductive parts must be measured during the normal operating state of the system.

Make sure that control cables or data cables between the components of the system are not mistaken for a ground wire connection.

During the measurement, the power cable and additional connection cables, which also create the ground wire connection between system parts (e.g. monitor cable between the basic unit and monitor trolley,) must be moved section by section to detect cable breaks.

Ground wire resistance may not exceed 0.2 ohms.

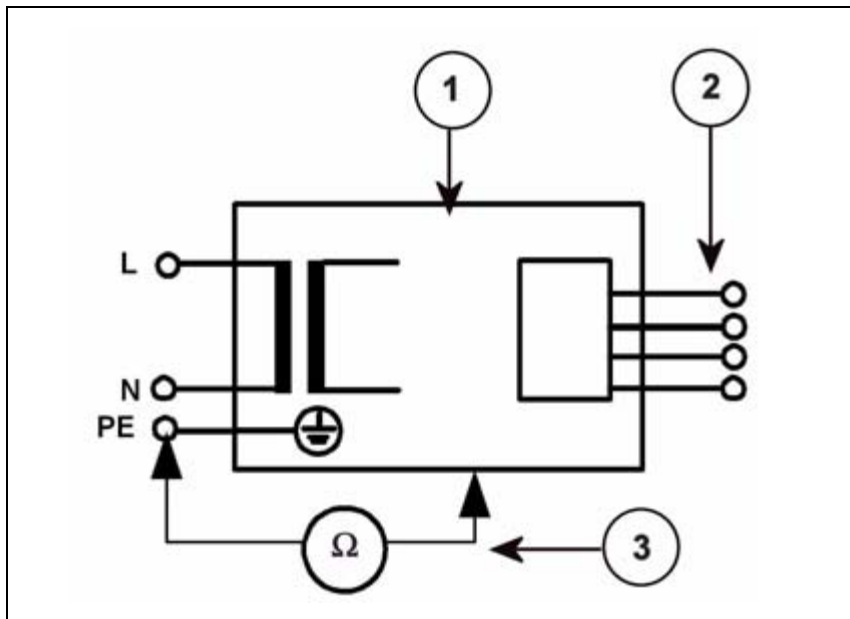


Fig. 1: Measuring circuit for measuring the protective conductor resistance for units that are disconnected from power, in compliance with DIN VDE 0751-1/2001-10, Fig. C2.

- Pos. 1 = System
 Pos. 2 = Application part type B (if available)
 Pos. 3 = Measurement setup (integrated into measuring device)

System leakage current measurement information

NOTE

If parts in the primary circuit (e.g., power cable, line filter, power transformers, or complete power-on modules) are replaced during service work, the system leakage current measurement must be subsequently performed and recorded as a repeat measurement.

However, the first measured value is to be newly determined and a new protocol is to be created under the following conditions:

- Lack of system leakage current measurement documentation
- Local line voltage or line frequency deviating from the line voltage and line frequency values documented in the protocol (e.g., in the event of a site/operator change)
- Use of a different procedure for measuring the system leakage current than the one documented in the protocol.

For the purpose of traceability, reference to the new protocol must be made in the old protocol. The first measured value must be newly determined so that it can be documented and confirmed with a name and signature.

Observe the instructions in the "Safety Rules for Installation and Repair" (ARTD-002.731.17 ...).



WARNING

Electrical voltage!

Noncompliance can lead to severe injury and even death.

- ⇒ **The system leakage current measurement may be performed on units of protection class I only after the ground wire test has been passed.**

First measured value

The first measured value was already determined and documented in the system leakage current protocol. The measuring procedure was also recorded.

The measurement was performed with the recorded line voltage, line frequency and measuring equipment.

Measurement

Perform the measurement according to DIN VDE 0751, Part 1 (see ARTD-002.731.17....), and record the determined value.

The measuring procedure indicated in the protocol must be used.

If the first measured value needs to be newly determined (see previous information), a measuring procedure can be selected (direct measurement or differential measurement).

Measurement of the system leakage current according to the differential current method (measurement setup according to (Fig. 2 / p. 15)) must be given preference, since this method is not dangerous to the person performing the measurement and other persons.

However, please note the minimum resolution of the system leakage current measuring instrument and any additional manufacturer's data restricting the use of the measuring device.

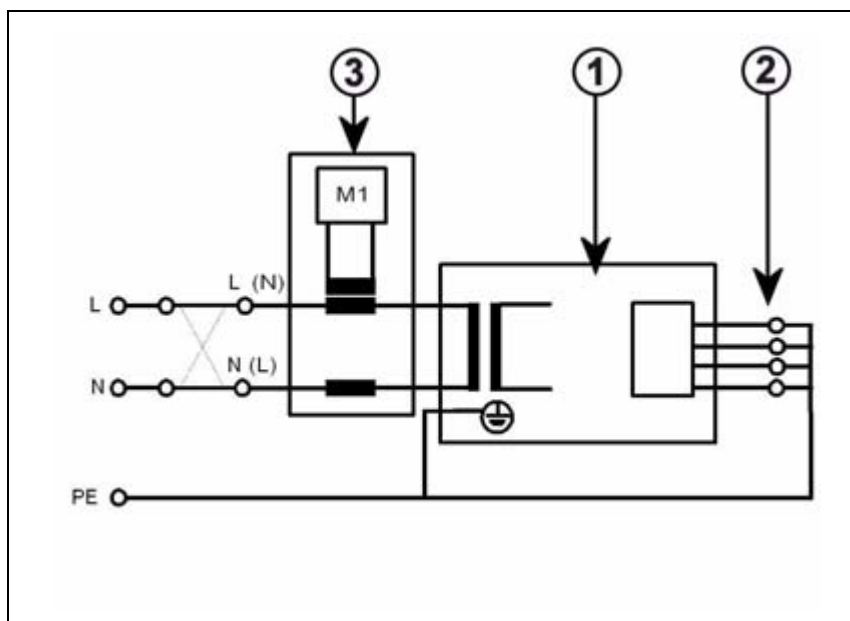


Fig. 2: Measuring circuit for measuring the system leakage current according to the differential

current method in compliance with DIN VDE 0751-1/2001-10, Fig. C6 for protection class I.

- Pos. 1 = System
 Pos. 2 = Application part type B (if available)
 Pos. 3 = Measurement setup (integrated into measuring device)

If the direct measurement of the system leakage current is used (measurement setup according to (Fig. 3 / p. 16)), the system must be insulated during the measurement and must not be touched.

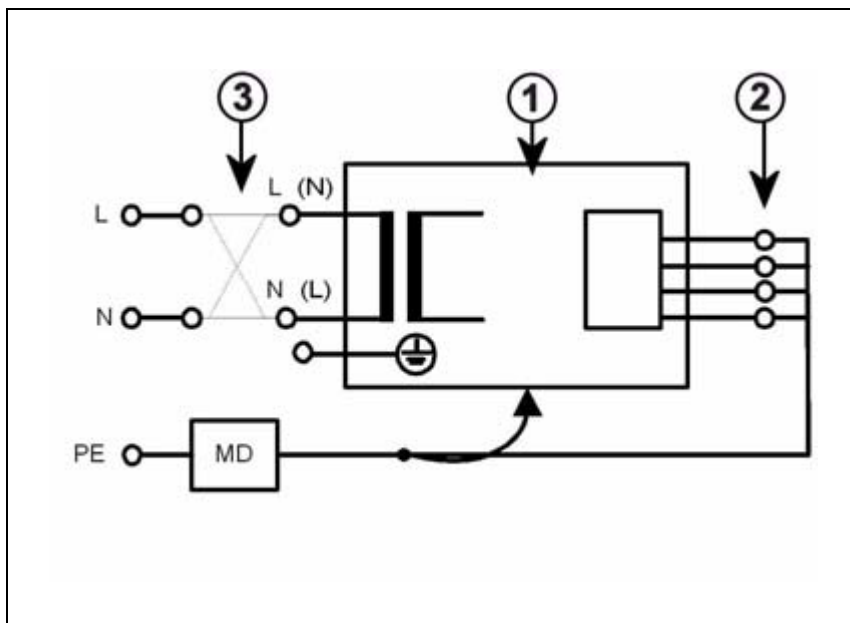


Fig. 3: Measuring circuit for direct measurement of the system leakage current in compliance with DIN VDE 0751-1/2001-10, Fig. C5 for protection class I.

- Pos. 1 = System
 Pos. 2 = Application part type B (if available)
 Pos. 3 = Measurement setup (integrated into measuring device)

WARNING

Electrical voltage!

Noncompliance can lead to severe injury and even death.

- ⇒ **No housing parts of the system may be touched during direct measurement of the system leakage current (measurement setup according to (Fig. 3 / p. 16))**
- ⇒ **Third-person access to the system must be prevented.**

The system must be switched on during the measurement. Measuring devices with automated measuring sequences must therefore be set to manual measurement.

The highest value must be entered in the system leakage current protocol.

This value must not exceed the permissible system leakage current values according to DIN VDE 0751-1/2001-10, Table F.1, line "system leakage current for units according to remarks 1 and 3" of 2.5 mA.

Measure and record the current line voltage. If the measured line voltage deviates from the nominal voltage, correct the measured value to the value corresponding to a measurement at the nominal value of the line voltage. This must also be documented.

Document the measuring procedure (differential measurement or direct measurement) and the measuring device used (designation and serial number).

In the case of repeat measurements, the measured value must also be evaluated.

NOTE

For evaluation purposes, the first measured value and the values documented during maintenance or safety checks must be compared to the measured values. A sudden or unexpected increase in the measured values may indicate that a fault has occurred in the primary power supply circuit (insulation damage, damage caused by humidity, defective interference suppressor, etc.) - even if the limit value of 2.5 mA is not exceeded.

Evaluation is not necessary in the case of a new determination.

The protocol sheet must be filed in the system folder or log book.

Information on navigation systems installed as options

This ARCADIS system can be used in combination with navigation systems supplied by various navigation system manufacturers.

The use of the navigation system lies within the responsibility of the customer.

Some service tasks can affect the accuracy of the navigation system.



Some service work steps performed on the ARCADIS system will lead to inaccuracy in a navigation system installed optionally.

Failure to take the necessary steps to address this situation can lead to severe injuries in the patient.

⇒ **If service work steps are performed on the ARCADIS system that can affect the accuracy of optionally installed navigation systems (see list below), the customer must be notified verbally and/or in writing that the accuracy of the installed navigation system is no longer guaranteed after such service work steps have been performed, and that the accuracy of the navigation system must be checked and certified before it is used again.**

Service work steps that can affect the accuracy of the installed navigation system:

- All work steps that affect the geometry of the C-arm and its components, such as:
 - ⇒ Removing or installing the I.I.
 - ⇒ Removing or installing the I.I. housing
 - ⇒ Removing or installing the I.I. mounting ring on the I.I.
 - ⇒ Removing or installing the I.I. grid
 - ⇒ Removing or installing the I.I. optics
 - ⇒ Removing or installing the CCD camera
 - ⇒ Removing or installing any mechanical components of the C-arm
- Any adjustments that alter the geometry of the imaging components, such as:
 - ⇒ Adjustment of camera optics (optical sharpness, image size)
 - ⇒ Adjustment of camera rotation (positioning with respect to I.I. optics)
 - ⇒ Adjustment of I.I. geometry and sharpness (I.I. mini voltage supply)
- Any subsequent installation of released options that affect the geometry of the C-arm and its components, such as:
 - ⇒ Integrated laser light localizer option (geometric alteration)
 - ⇒ I.I.laser light localizer option (weight alteration)
 - ⇒ 2D Navigation Option (Attachment of altered mounting ring to I.I.)

Service, shutdown, hibernation, handover to the customer

 WARNING

Switching the system off via hibernation (version VB13C and later) after service or before handover to the customer is not sufficient.

Various error messages can appear after the next system boot and any configuration changes are not saved.

- ⇒ A proper shutdown must be performed for configuration changes to be saved correctly. Shut down the system via the upper monitor menu bar <Options>--<End Session>--<Shut Down System>, and then turn the system off via the switch on the monitor trolley.

NOTE

Before the system is handed over to the customer, it must be shut down properly via the menu bar <Options>--<End Session>--<Shut Down System>.

Putting the system into hibernation mode (on/off button on the monitor trolley) is not sufficient.

Covers



Electrical voltage!

If ignored, death or serious physical injury can occur.

⇒ **Disconnect the line voltage plug prior to removing the covers.**

Main system, rear cover

Removing the cover of the basic unit

1. Apply the foot brake.
2. Remove the foot switch.
3. Remove the screws from the rear cover.
4. Pull the cover away to the back.
5. Unscrew the protective conductor from the cover.
6. Pull the cover completely off and remove it.
7. Reinstall the cover in reverse order.

Main system, horizontal carriage

Removing the cover of the horizontal carriage

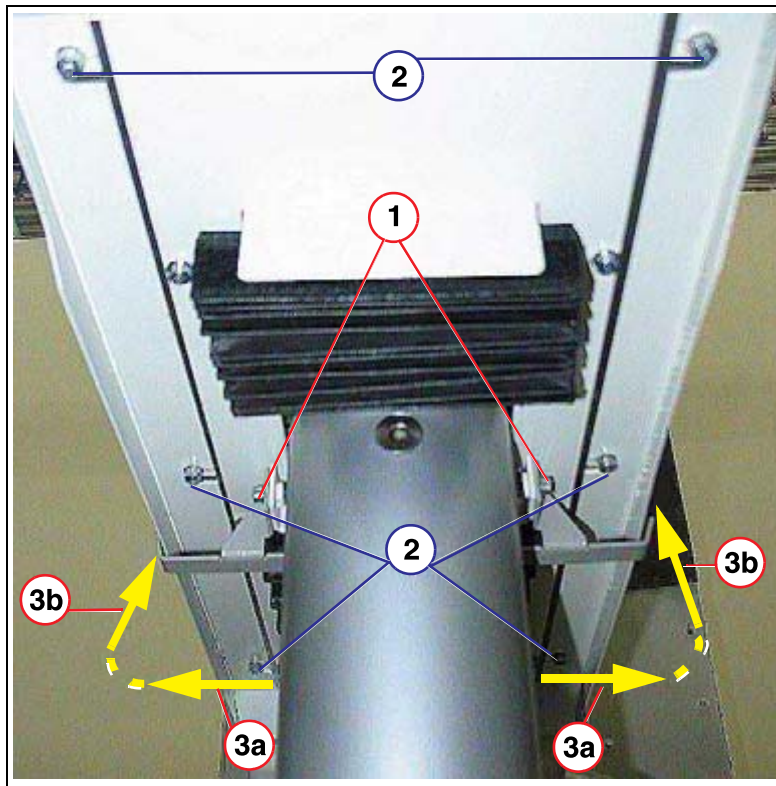


Fig. 4: cover_1

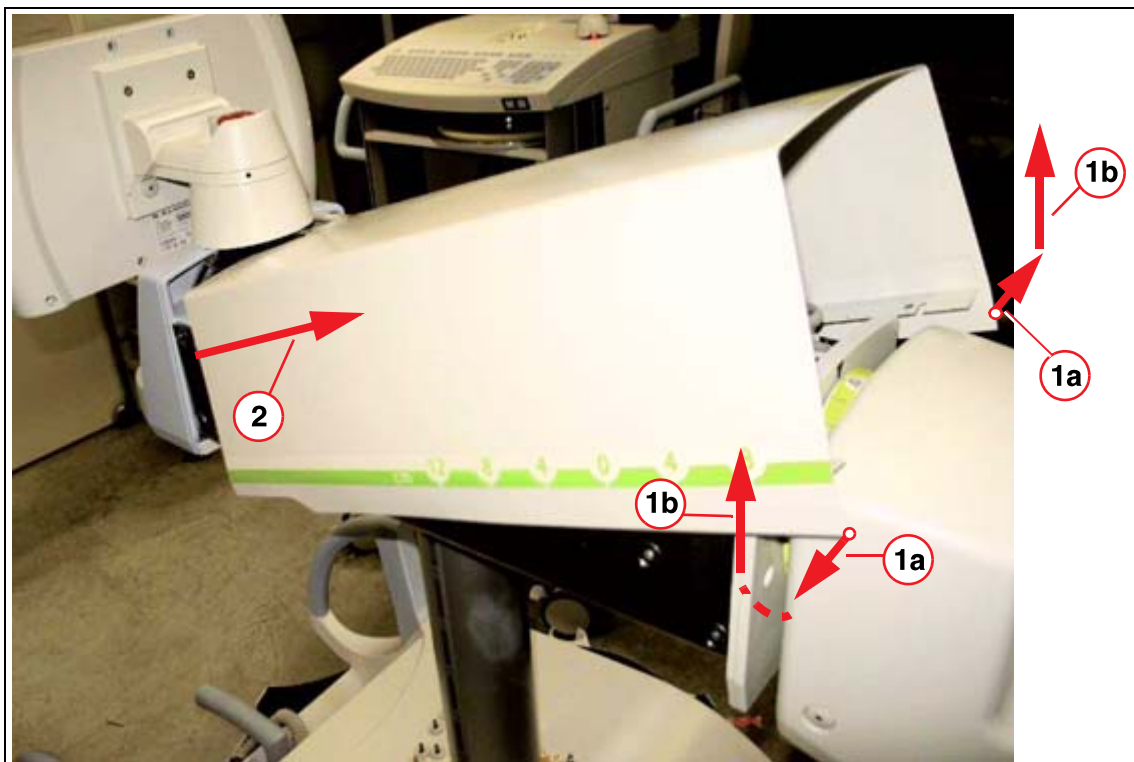


Fig. 5: Cover_2

CAUTION

Danger of injury when dismantling/assembling mechanical parts!
Noncompliance can lead to minor to moderately severe injury, especially to the hands!

- ⇒ The cover over the horizontal carriage is U-shaped and must be pulled on the side to the outside when it is removed. This places the cover under mechanical stress.
- ⇒ We recommend wearing light work gloves to avoid injuries.

1. Unscrew the 2 screws (1/Fig. 4 / p. 21).
2. Unscrew the 6 screws (2/Fig. 4 / p. 21).
3. Expand the cover at the end (3a/Fig. 4 / p. 21) (1a/Fig. 5 / p. 22) and pull the cover upward (3b/Fig. 4 / p. 21) (1b/Fig. 5 / p. 22).
4. Pull out the cover as shown in (2/Fig. 5 / p. 22).
5. Reattach the cover in reverse order.

Monitor trolley, cover panels

Removing the cover panels

1. Remove the 4 screws from the middle back cover to access the imaging system (rear).
2. Remove the upper back cover plate of the log book compartment.
3. Remove the lower back cover to access the power supply.
4. Remove the front cover to access the imaging system (front).

Installing the cover panels

1. Install the covers in reverse order.

Service position slide-in module

Service position of the board slide-in module in the unit

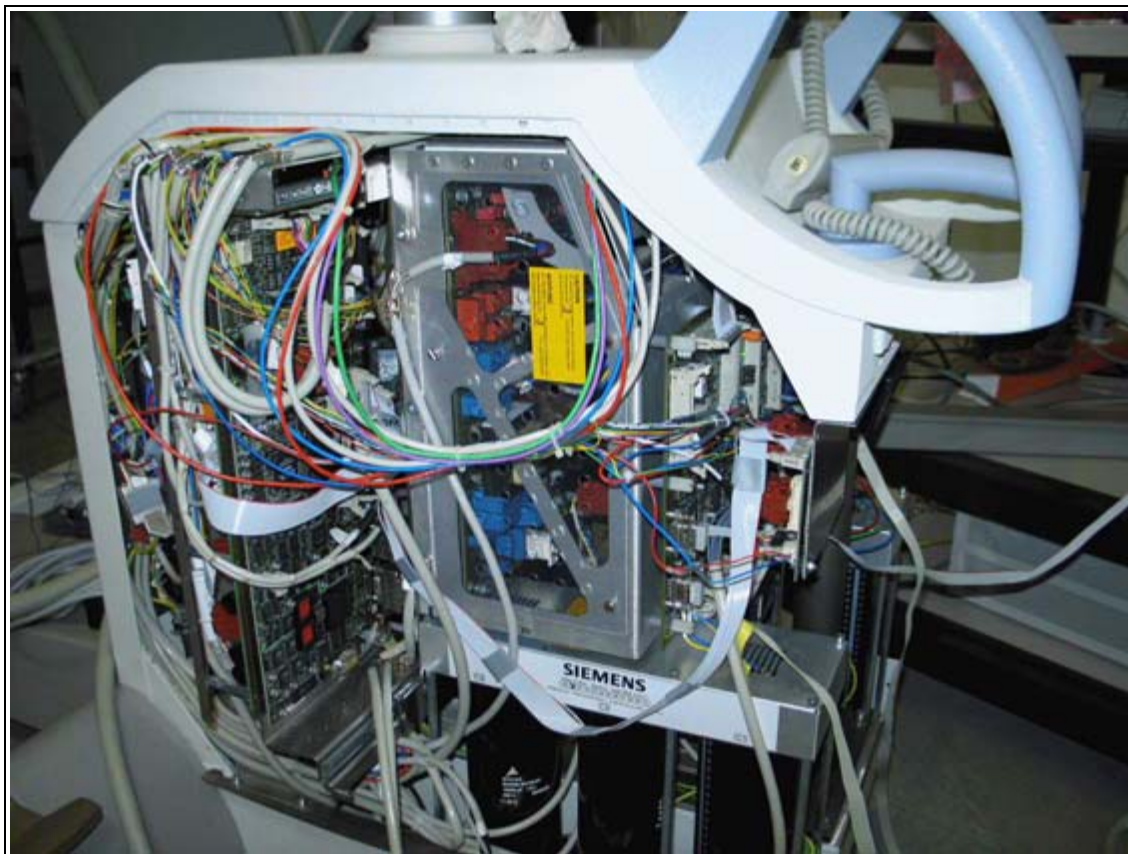


Fig. 6: Service_position

1. The board slide-in module can be withdrawn after loosening the two screws [\(Fig. 6 / p. 24\)](#).

Concluding steps

NOTE

Observe the guidelines on the protective conductor test and the leakage current measurement in this chapter.

- If necessary, perform the leakage current measurement.
- After all work has been completed and all covers have been closed, perform the protective conductor test according to ARTD-002.731.17...
 - ⇒ The protective conductor resistance must not exceed 0.2 ohms.

Power supply M13, +13 V_

Electrical voltage!**If ignored, death or serious physical injury can occur.****⇒ Switch the system power supply off.**

1. Remove the Plexiglas cover over the power supply. Remove the 4 Allen screws.
2. Replace the power supply.
3. Check the power supply voltage and adjust if necessary ([Voltages / p. 88](#)).

Power supply M14, +5 V_ / +15 V _ / -15 V_



Electrical voltage!

If ignored, death or serious physical injury can occur.

⇒ **Switch the system power supply off.**

1. Replace the power supply.
2. Check the power supply voltages and adjust if necessary ([Voltages / p. 88](#)).

Control board D1

WARNING

X-ray radiation!

If ignored, death or serious physical injury can occur.

⇒ **Observe the safety instructions!**

Replacement and additional work



1. Withdraw the slide-in module with D1 and D30 in the working position (Fig. 6 / p. 24).
2. Loosen all plug connections to board D1
3. Replace board D1. Pay attention to the insulating disks.
4. Plug all connection cables back in. Make sure the shields and ground wires are properly positioned.
5. Plug in or switch the jumpers and switches according to the wiring diagram. In particular, check jumpers X95, X96, and X99.
6. Perform the download of the control board D1.

NOTE

With software version VB13B, the system serial number (31xxx) must be entered and saved manually under <Main System>-<Configuration>-<Main System>. A restore to the main system must be performed beforehand.

7. Restore the parameters of the system to board D1. Open the local service, select the "Backup/Restore" menu and restore the main system parameters.
8. Under the <Adjustments> menu, click <Generator Adjustment> and perform a generator adjustment.
9. Under the <Dose rate Adjustment> menu, check the dose rate and adjust it if necessary.
10. Check the function of the collimator; adjust if necessary.
11. Check the function of the collimator displays on the monitor and adjust if necessary.
12. Check the function of the area dose product measuring device (if present).
13. Check the FL / PFL / DCM / DR functions.

WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Safety information and protective measures".

⇒ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Interface board D30



Electrical voltage!

If ignored, death or serious physical injury can occur.

⇒ **Switch the system power supply off before replacing the board.**



1. Replace interface board D30.
2. Check the +27 V_ /+24 V_ /+24 V_ voltages; adjust if necessary ([Low voltages / p. 88](#)).
3. Check the radiation release / format switch-over / vertical column travel / brake functions.

Generator, D21 including MCB2

**WARNING****Electrical voltage!****If ignored, death or serious physical injury can occur.**

- ⇒ **Switch the system power supply off before replacing the board.**

**WARNING****Electrical voltage!****If ignored, death or serious physical injury can occur.**

- ⇒ **Switch the system power supply off.**
- ⇒ **Wait until LEDs V147 and LED F3-F8 have gone out. To ensure safety, after discharge of the capacitor batteries, the voltage can be checked at test points U_{z-} and U_{z+} . The voltage must be $< 20 \text{ V DC}$.**



1. Loosen all plug and screw connections to D21.
2. Mount the fan.
3. Replace D21. Pay attention to the insulating disks.
4. Make plug and screw connections. Make sure shields and ground wires are properly located and have good contact.
5. Perform generator download. After the download, switch the system off and on again.
6. Perform generator adjustment.
7. Perform the IQ test.

Mains converter board D20

**Electrical voltage!**

If ignored, death or serious physical injury can occur.

- ⇒ Switch the system power supply off.
- ⇒ Wait until LEDs V147 and LED F3-F8 have gone out. To ensure safety, after discharge of the capacitor batteries, the voltage can be checked at test points U_{z-} and U_{z+} . The voltage must be $< 20 \text{ V DC}$.



1. Measure the ZW voltage. The voltage must be $< 20 \text{ V}_-$.
2. Loosen all plug and screw connections that go to the outside from the generator unit, boards D20, D21 and D115, also the 3 internally located connectors on the bottom of D20.
3. Unscrew the side plastic covers.
4. Remove the 4 fastening screws on the back of the unit.
5. Push the unit out to the side and place it on a suitable base. Exercise caution with the cables and ribbon cables, otherwise damage may occur.
6. Remove coil connections X10 and X11 on D20.
7. The front aluminum plate has 9 fastening screws with contact washers, in each case 3 above and 3 on the sides. Loosen only the lower screws located on the sides. Unscrew the 7 upper screws.
8. Hinge up the front aluminum plate and loosen the internal plug connections.
9. Remove board D20 including cooling plate.
10. Install new board D20 including cooling plate.
11. Assembly and installation of the unit is performed in the reverse order.
12. Tighten cable connections X7 to X11 with a torque of 4.8 Nm.
13. Perform visual inspection. Make sure shields and ground wires are properly located and have good contact. Pay particular attention to plug connection X5 and X6 on D115.
14. Perform generator learning.
15. Check FL / PFL / DCM / DR functions.

Starting unit D115

**WARNING****Electrical voltage!**

If ignored, death or serious physical injury can occur.

- ⇒ Switch the system power supply off.
- ⇒ Wait until LEDs V147 and LED F3-F8 have gone out. To ensure safety, after discharge of the capacitor batteries, the voltage can be checked at test points U_{z-} and U_{z+} . The voltage must be $< 20 V_{-}$.



1. Measure the ZW voltage. The voltage must be $< 20 V_{-}$.
2. Loosen all plug and screw connections that go to the outside from the generator unit, boards D20, D21 and D115, also the 3 internally located connectors on the bottom of D20.
3. Unscrew the side plastic covers.
4. Remove the 4 fastening screws on the back of the unit.
5. Push the unit out to the side and place it on a suitable base. Exercise caution with the cables and ribbon cables, otherwise damage may occur.
6. The front aluminum plate has 9 fastening screws with contact washers, in each case 3 above and 3 on the sides. Loosen only the lower screws located on the sides. Unscrew the 7 upper screws.
7. Hinge up the front aluminum plate and loosen the internal plug connections.
8. Remove board D115.
9. Apply heat conduction paste under the power module.
10. Install new board D115.
11. Assembly and installation of the unit in the reverse order.
12. Perform visual inspection. Make sure shields and ground wires are properly located and have good contact. Pay particular attention to plug connection X5 and X6 on D115.
13. Check the FL / PFL / DCM / DR functions.

Generator capacitor buffer modules



Electrical voltage!

If ignored, death or serious physical injury can occur.

- ⇒ Switch the system power supply off.
- ⇒ Wait until LEDs V147 and LED F3-F8 have gone out. To ensure safety, after discharge of the capacitor batteries, the voltage can be checked at test points U_{z-} and U_{z+} . The voltage must be $< 20 \text{ V DC}$.



1. Measure the ZW voltage. The voltage must be $< 20 \text{ V}_-$.
2. Loosen all plug and screw connections that go to the outside from the generator unit, boards D20, D21 and D115, also the 3 internally located connectors on the bottom of D20.
3. Unscrew the side plastic covers.
4. Remove the 4 fastening screws on the back of the unit.
5. Push the unit out to the side and place it on a suitable base. Exercise caution with the cables and ribbon cables, otherwise damage may occur.
6. Replace the defective capacitor buffer module.
7. Install the generator unit in the reverse order.
8. Check the FL / PFL / DCM / DR functions.

Control console

Removing the control console

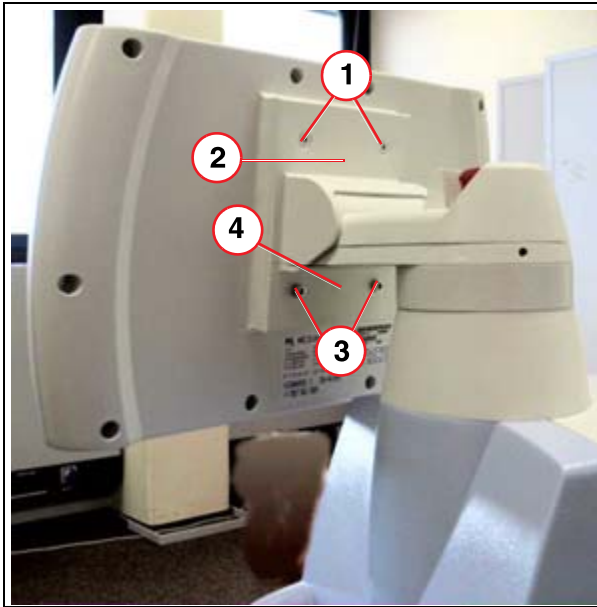


Fig. 7: control_console

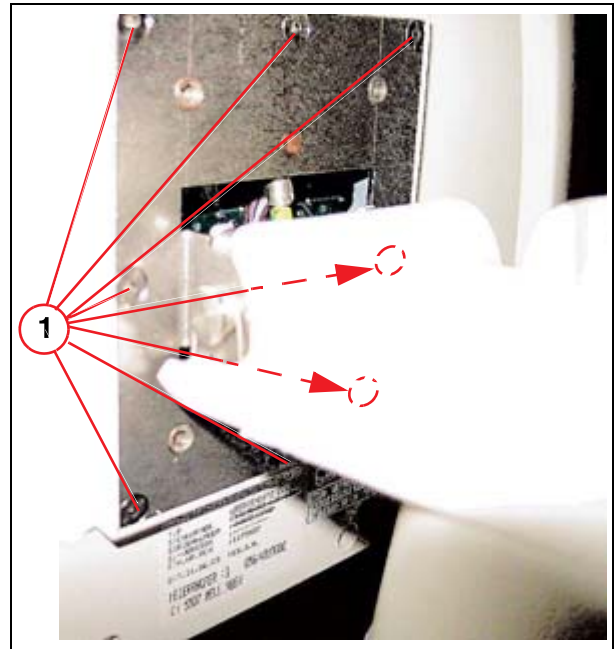


Fig. 8: Control_console_2

1. Switch the system off.
2. Unscrew the 2 Allen screws (1/Fig. 7 / p. 34).
3. Remove the cover (2/Fig. 7 / p. 34).
4. Unscrew the 2 Allen screws (3/Fig. 7 / p. 34).
5. Remove the cover (4/Fig. 7 / p. 34).
6. Unscrew the 5 Allen screws (1/Fig. 8 / p. 34), unplug the connectors and remove the control console.



Emergency stop

Removing the emergency stop

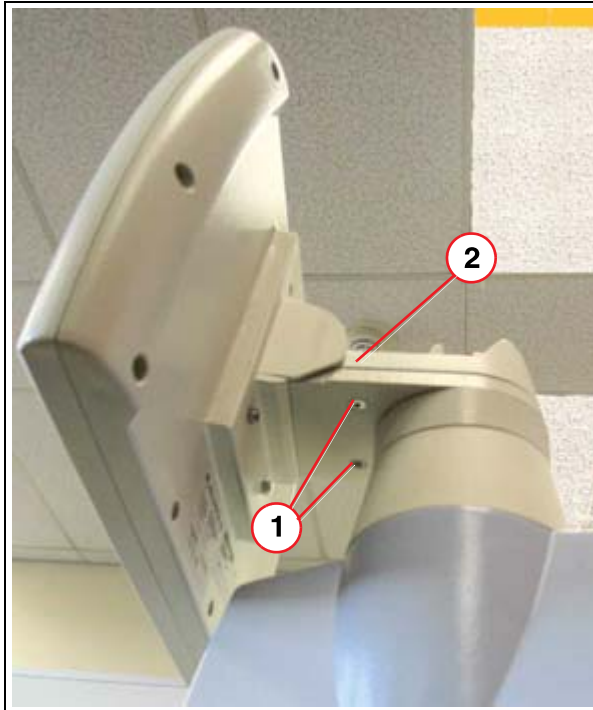


Fig. 9: Emergency stop

1. Switch the system off.
2. Unscrew the 2 Allen screws ([1/Fig. 9 / p. 35](#))
3. Remove the cover ([2/Fig. 9 / p. 35](#)).
4. Unplug and remove the emergency stop.

Single tank replacement

Storing the load counter data

NOTE

To ensure compliance with refund requirements for the old single tank, it is necessary to send the load counter data, stored on CD, and the failure report together with the single tank back to the factory.

Store load counter data

1. Switch on the system and insert a CD into the CD-ROM drive.
2. Open the service application.
3. Click on <Reports> and <Configuration Online>.
 - ⇒ A new report of the main system will be generated.
4. Click on <Exit> to close this window.
5. Click on <Eventlog> and <Burn Log-Files> in the service menu.
 - ⇒ A window appears "Do you want to burn a newly created developer SaveLog too?" (window appears only with versions SW VB13C and later).
6. Click on <Yes> , <Select All> and <Burn Files>.
 - ⇒ All data will be burned to CD, including the current load counter data and the event log.

Removing the single tank

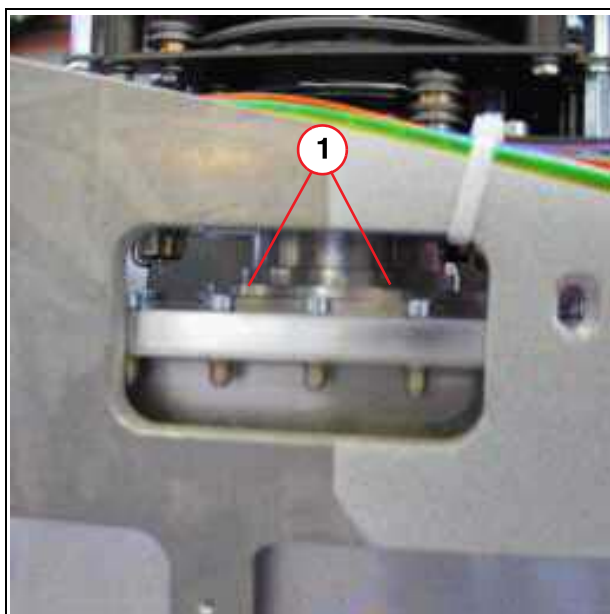


Fig. 10: Collimator_mount

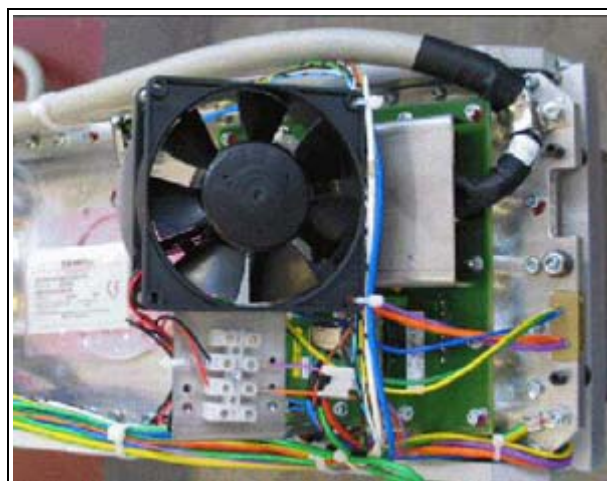


Fig. 11: tank_connection

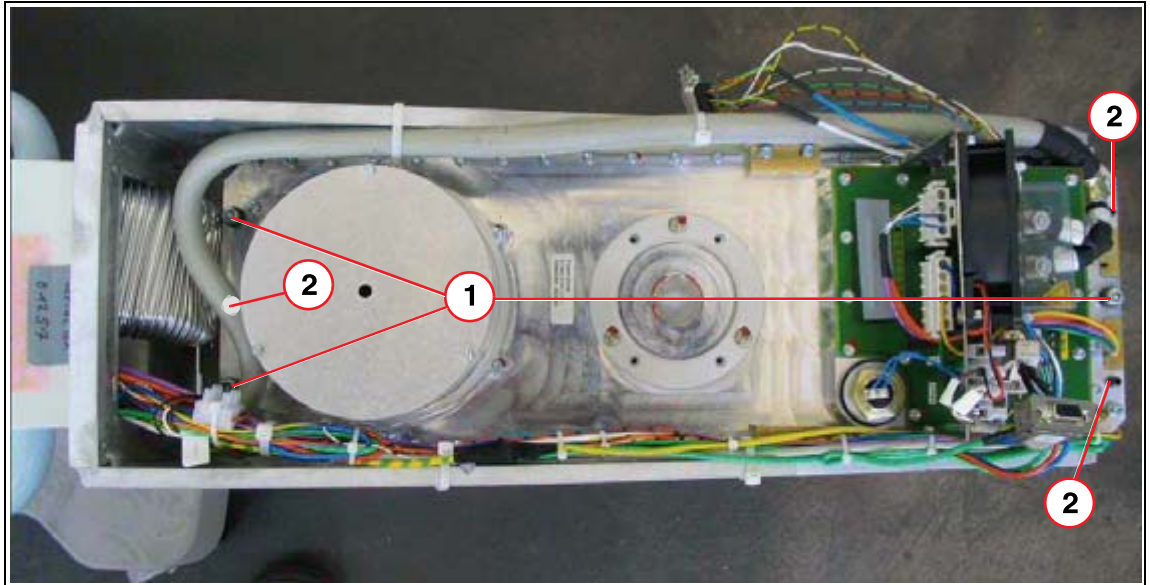


Fig. 12: Adjustment

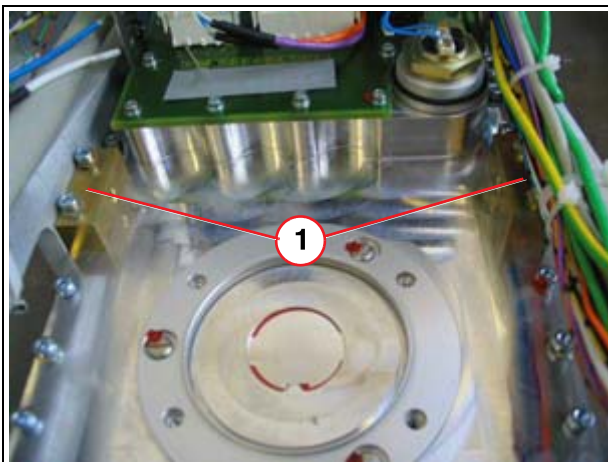


Fig. 13: Bracket

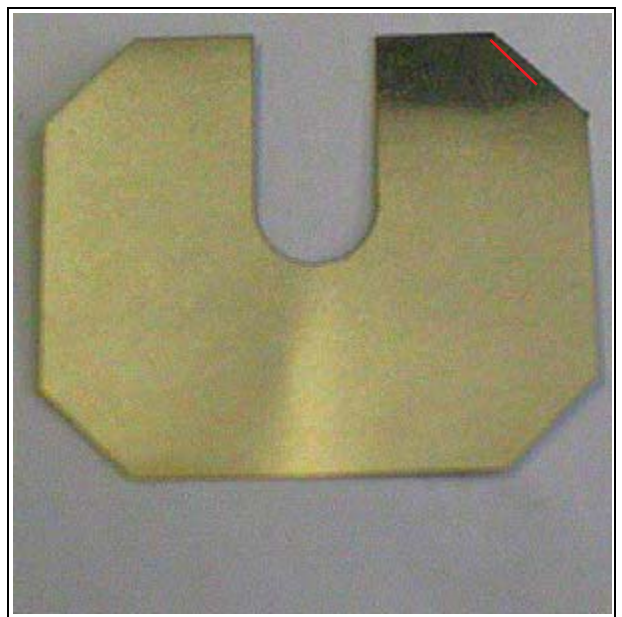


Fig. 14: Shim



Fig. 15: tank_mount

1. Switch the system off.
2. Remove the single-tank cover.
3. If present, remove the dose measuring chamber.
4. Remove the 4 Allen screws from the collimator and remove the collimator (1/Fig. 10 / p. 36).
5. Loosen all plugs, screw and cable connections from the single tank (Fig. 11 / p. 36).
6. Remove the bracket with fan (Fig. 11 / p. 36).
7. Remove the ISK screw from the connection single tank housing - bracket (1/Fig. 13 / p. 37).
 - ⇒ Single tank housing to bracket is 1 ISK screw at each side.
 - ⇒ Remove the shim(s) (Fig. 14 / p. 37) and remember the position for the installation of the new single tank.
8. Before the replacement, note the height of all grub screws (2/Fig. 12 / p. 37).
9. Loosen the fastening Allen screws of the single tank (1/Fig. 12 / p. 37).
10. Remove and set down the single tank (Fig. 15 / p. 38).
 - ⇒ Guide cable ties through the front and the two rear holes of the fastening screw.
11. Unscrew the grub screws (2/Fig. 12 / p. 37) and screw them into the new single tank.



Installing the single tank

CAUTION**Risk of injury!**

Risk of injury! Noncompliance can cause minor to medium injury due to crushing of the fingers.

- ⇒ **Be very careful when inserting the single tank in the C-arm.**

NOTE**The cables must not be crushed!**

On the basic unit, pull out connector D21.X3 from board D21.

With an ohmmeter, measure from all leads of the connector X3 (cable side) to protective ground wire. There must be no connection to the protective ground wire!

1. Switch the system off.
2. Bring the new single tank into the C-arm. Pay attention to cables and your fingers.
3. Attach the single tank with the 3 Allen screws (1/Fig. 12 / p. 37) to the C-arm.
4. Attach the collimator with the 4 Allen screws (1/Fig. 10 / p. 36).
5. If present, attach the dose measuring chamber.
6. Install the bracket with fan (Fig. 11 / p. 36).
7. Connect all cables (Fig. 11 / p. 36).
 - ⇒ Fan + / -
 - ⇒ D25 X1 / X3 / X789 / X7 / X9
 - ⇒ X32
 - ⇒ Z66 X1
 - ⇒ Ground wire
8. Tighten cable connections X7 and X9 (Fig. 11 / p. 36) with a torque of 4.8 Nm.
9. Make sure the cables all run properly and shields are correctly clamped.
10. Set the grub screws (2/Fig. 12 / p. 37) to the distances noted at the start.
11. Screw in the fastening screws (1/Fig. 12 / p. 37), but do not tighten them; leave a few millimeters distance to the housing.
12. Switch on the system.
13. Check the function of the two fans.
 - ⇒ The visible fan must turn.
 - ⇒ The fan installed in the C-arm must run audibly. The visible fan can be stopped mechanically for a short time for this purpose.
14. Enter the new single tank serial number under <Local Service>-<Configuration>-<Load Counter>.
15. Reset the load counter under <Local Service>-<Configuration>-<Load Counter>.



16. Perform a generator adjustment <Local Service>-<Main System>-<Adjustment>-<Generator Adjustment>.

⇒ The new single tank serial number is shown under <Local Service>-<Main System>-<Adjustment>-<Load Counter>.



17. Start fluoro and set the collimator opening on the monitor so that all sides are still just visible and stop fluoroscopy.

18. Determine the direction in which the single tank must be aligned.

⇒ Image reversal should be deselected

19. By setting the grub screws (2/Fig. 12 / p. 37) on the single tank, adjust the collimator centrally on the monitor.

20. After each adjustment, release fluoro briefly to display the change on the monitor (LIH).

21. After the collimator has been centered, tighten the fastening screws (1/Fig. 12 / p. 37) uniformly. Take care that the radiation field does not migrate again.

22. Switch on fluoroscopy briefly and check the collimator position.

23. Fix each bracket (1/Fig. 13 / p. 37) with the ISK screw and insert the shim (s) (Fig. 14 / p. 37) into the required position before tightening the Allen screws (use Loctite 221).

⇒ No gap should be between the bracket (1/Fig. 13 / p. 37) and the single tank housing.

24. The blades of the X-Iris must be visible on all sides of the monitor image in fluoroscopy in the full format and zoom format at maximum opening.

25. Check and if necessary adjust the X-Iris and slot diaphragm positions (in the full format and zoom format).

26. Check the function of the area dose product measuring device (if present).

27. A 2nd set of identification labels of the single tank is glued onto the basic unit. Remove the old identification labels of the collimator and glue the supplied labels to the same place. The original labels of the single tank must agree with the glued-on labels.

28. Send the old single tank back to the factory, together with the failure report and the previously burned CD with the load counter data.

Fans

Visible fan

1. Remove single-tank cover.
2. Disconnect the wires (+ / -) of the fan.
3. Remove the fan (Fig. 11 / p. 36).
4. Install the (new) fan in reverse order.

⇒ Pay attention to direction of rotation, airflow direction = single tank

Fan installed in the C-arm

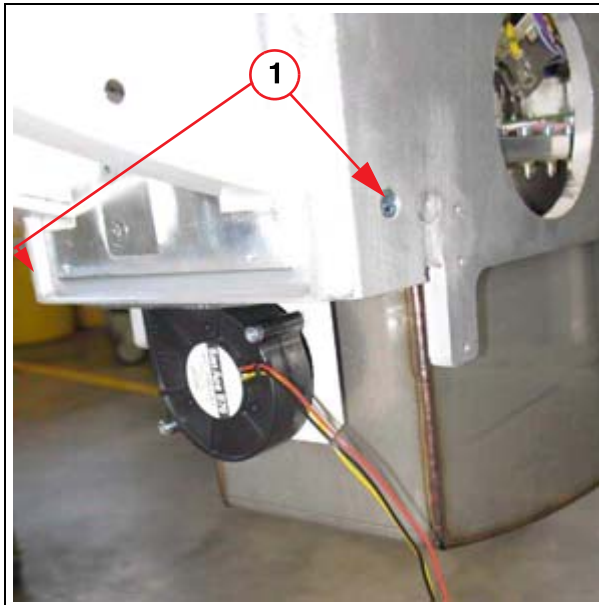


Fig. 16: Fan_Single_Tank

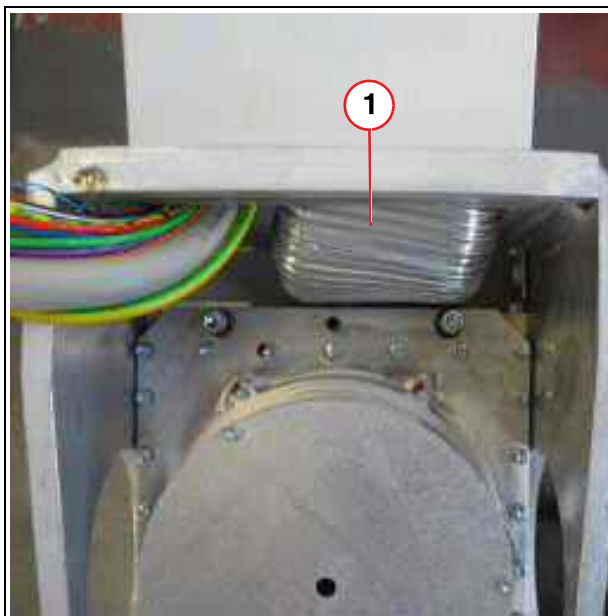


Fig. 17: fan

1. Switch the system off.
2. Remove single-tank cover.
3. Disconnect the wires (+ / -) of the fan.
4. Remove the 2 Allen screws from the fan housing ([1/ Fig. 16 / p. 41](#)).
5. Remove the flexible tube ([1/ Fig. 17 / p. 41](#)) from the bracket of the fan.
6. Remove the fan.
7. Install the (new) fan in reverse order.
 - ⇒ Pay attention to direction of rotation, airflow direction = single tank

Collimator

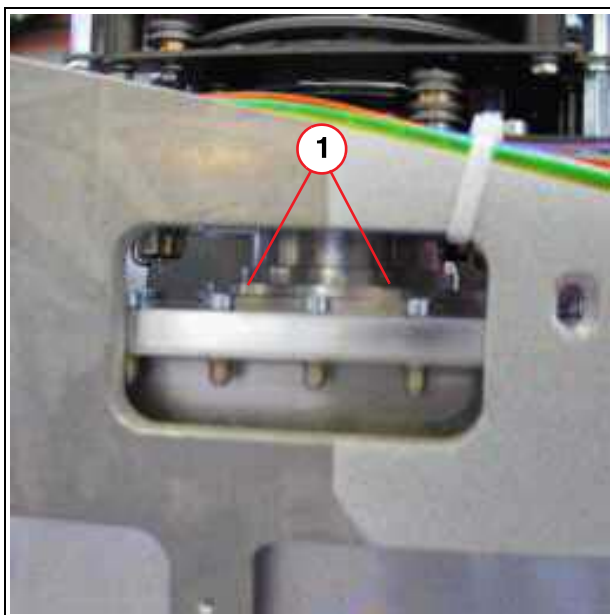


Fig. 18: Collimator_mount

1. Switch the system off.
2. Remove the 2 Allen screws (1/Fig. 18 / p. 42) from both sides of the collimator cut-outs and remove the collimator.
3. Install the new collimator in reverse order.
4. Check the function and setting of the collimator, readjust if necessary.
 - ⇒ The blades of the X-iris on all sides of the monitor image in full format and in all zoom formats.
5. Check the collimator displays on the monitor and readjust if necessary.
6. A 2nd set of identification labels of the collimator is glued onto the basic unit. Remove the old labels of the collimator and glue the supplied labels to the same place. The original labels of the collimator must agree with the glued-on labels.

Dose area product measuring device

1. Switch the system off.
2. Remove the single-tank cover.
3. Replace the dose area product measuring device.
4. Open the local service and select <Main System>-<Adjustment>-<DAP / Air Kerma> and check the accuracy of the dose area product measuring device.
 - ⇒ Perform a DAP accuracy check if "DAP display" is configured at the monitor.
 - ⇒ Perform an air kerma accuracy check if "air kerma display" is configured at the monitor.

Replacement of the I.I.

A suitable table to deposit the I. I. is required for this work.

Removing the I.I.

**WARNING**

Electrical voltage!

If ignored, death or serious physical injury can occur.

- ⇒ See chapter 2, Safety Information.
 - ⇒ Switch off the system and wait approx. 3 minutes so that the high voltages on the I.I. mini power supply die away.
-

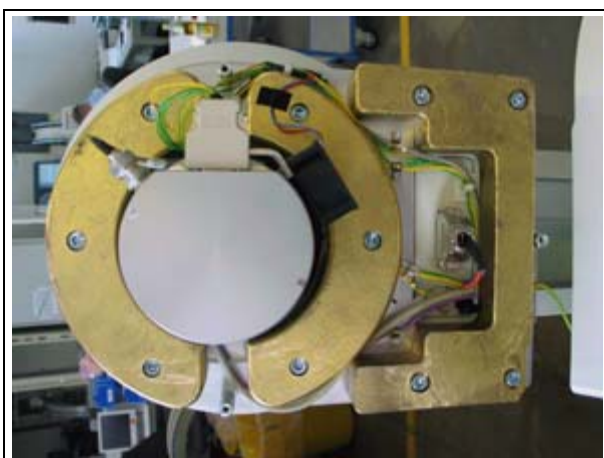


Fig. 19: view

1. Switch the system off.
2. Remove the cover of the camera from the I. I.
3. Remove the counterweights from the I. I. ([Fig. 19 / p. 44](#))
4. Disconnect all cables, cable ties and clips from the I.I. and the camera ([Fig. 19 / p. 44](#))
 - ⇒ Fan + / -
 - ⇒ M4 X1 / X2 (Gigalink)
 - ⇒ Laser I. I. X1
 - ⇒ HV 2000 X1
 - ⇒ M30 X1
 - ⇒ Ground wires

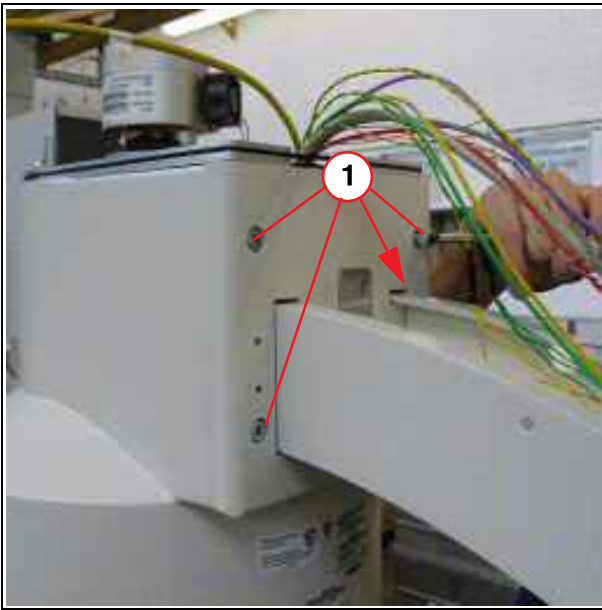


Fig. 20: I. I. cable

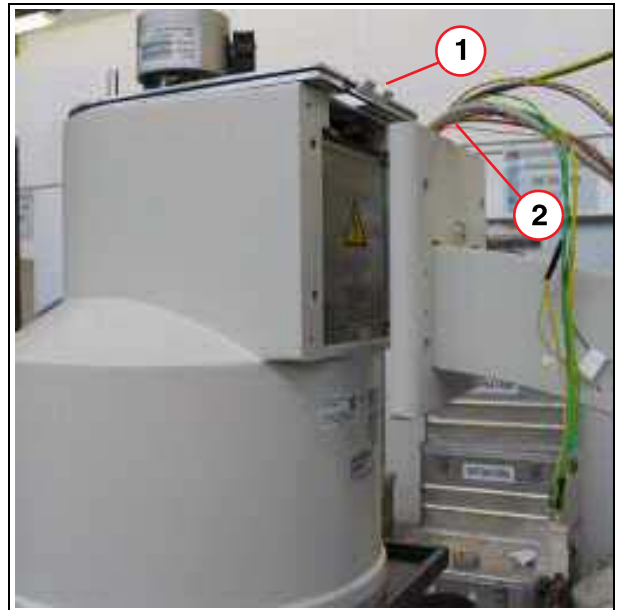


Fig. 21: I.I._mount

5. Remove the counterweight from the I. I.
6. Swivel the Image Intensifier in the upper position (single tank below)
7. Remove the grid from the I. I.
8. Place a suitable table underneath of the I. I.
9. Remove the 4 ISK screws and carefully deposit the I. I. on the table.
10. Remove the cable clamp (1/Fig. 21 / p. 45) and pull out the cables (2/Fig. 21 / p. 45).
11. Remove the three M4 screws from the camera optics (4/Fig. 26 / p. 51).

NOTE

Do not loosen the eccentric screws on the edge of the optics! These are used to center the optics with respect to the I.I. output screen. When removing the optics, make sure that no dust or dirt contaminates the I.I. output window or the optics.

12. Remove the optics and camera and place them on a dust-free surface

Installing the new I. I.

NOTE

When installing the optics, make sure that no dust or dirt contaminates the I.I. output window or the optics.

1. Reattach the optics and camera to the new I. I.
 - ⇒ The camera optics must lie against the eccentric screws.
2. Take the new I. I. to the C-arm holding device and screw in the 4 Allen screws (1/Fig. 20 / p. 45) to reattach the I. I. (use Loctite 221).

3. Reinstall and connect all cables, cables ties and clips back to the I. I. and the camera ([Fig. 19 / p. 44](#)).
4. Install the counterweight of the I. I.
5. Install the I. I. grid.
6. Install the cover (camera) from the I.I. housing.

Checks and adjustments

1. Check the I.I. electrode voltages according to the test protocol for the I.I. (see “Measuring the I.I. mini power supply voltages”)
 - ⇒ Do not make readjustments in cases where there are only slight deviations from the values on the test protocol (measurement device tolerances).
2. Check the centering, reproduction scale and camera focusing. Refer to the previous description ([Adjusting the camera and I.I. optics / p. 53](#)).
3. Check the X-iris setting and readjust it as necessary.
4. Check the display of the blades on the monitor and readjust it if necessary.
5. Check the dose rate and readjust it if necessary.
6. Check the resolution first and readjust the optical resolution of the I.I. optics if necessary ([Adjusting the camera and I.I. optics / p. 53](#)).
7. Perform the IQ test.
8. Complete the country-specific acceptance (§16 partial acceptance... /DHHS...).

WARNING
--

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed. See the chapter "Safety information and protective measures".

- ⇒ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**
-

I.I. mini power supply



Electrical voltage!

See chapter 1, Safety Information.

- ⇒ Switch the system power supply off and disconnect the power plug.



Electrical voltage!

If ignored, death or serious physical injury can occur.

- ⇒ See chapter 2, Safety Information.
- ⇒ Before you remove the high-voltage power supply, the system must be switched off > 3 minutes so that the high voltages on the I.I. mini power supply decay.

I.I. mini-voltage supply HV2000

Measuring the I.I. mini power supply voltages

1. Perform the measurement only after the HV 2000 power supply has been switched on for 10 minutes.
2. To measure the voltages, remove the RS 232 connector cover on top of the image intensifier to get access to the test points ([Fig. 22 / p. 48](#)) ([1/Fig. 23 / p. 48](#)).
 - ⇒ When the primary voltages are measured, the I. I. must not be removed.
3. Continue with “Exchanging or adjusting the I.I. mini power supply” if necessary.

Exchanging or adjusting the I.I. mini power supply

1. Remove the I.I. according to the section “Removing the I.I.”.
 - ⇒ Do not remove the camera, optics or I.I. grid.
2. Unscrew and slightly pull out the high-voltage power supply from the I.I.
3. Only for exchange: Replace the old high-voltage power supply with the new high-voltage power supply.
4. Continue with “Adjusting the I.I. mini power supply”.

Adjusting the I.I. mini power supply

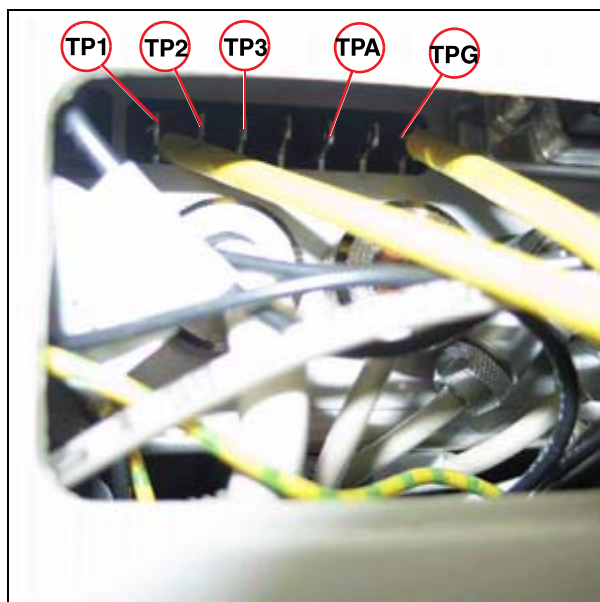


Fig. 22: measuring_points

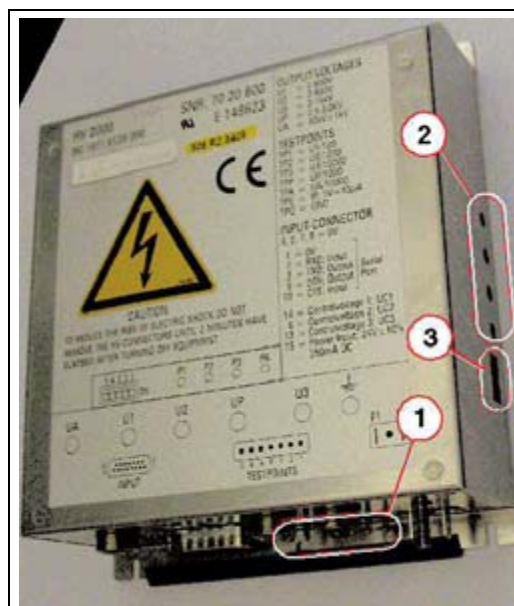


Fig. 23: I.I. power supply

Prerequisites

- To adjust the voltages, only unscrew the image intensifier and do not disconnect the camera connections or the image intensifier wire connections.
 - ⇒ With each format, the corresponding potentiometer is active (e. g., P1 for U1), and after the format is changed, the adjusted value will be stored in memory.
 - ⇒ The dip switches (3/ Fig. 23 / p. 48) must be set according to the following table.

Dip switch	Factory settings	Adjustment settings
S 1	ON	OFF
S 2	OFF	OFF
S 3	ON	ON
S 4	OFF	OFF
S 5	OFF	OFF

NOTE

The reference voltage listed in the Test Certificate for the individual electrodes must be set on the power supply so that the image intensifier is optimally adjusted.

Voltage	Test point	Potentiometer	Test Certificate Reference voltage	Voltage divider ratios
U1	TP1	P1	E1	1:100
U2	TP2	P2	E2	1:1000
U3	TP3	P3	E3	1:10000
UA (30 kV)	TPA	PA	A	1:10000
GND (0V)	TPG	n.a.	n.a.	n.a.

1. Perform the adjustments only after the HV 2000 power supply has been switched on for 10 minutes.
2. Adjust / measure the voltages at the following potentiometer (2/Fig. 23 / p. 48) and measuring points (1/Fig. 23 / p. 48).
 - ⇒ poti P1 - test point TP1
 - ⇒ poti P2 - test point TP2
 - ⇒ poti P3 - test point TP3
 - ⇒ poti PA - test point TPA
3. Reinstall the I.I. in reverse order.
4. Perform the IQ test.
5. Check the function and settings of the collimator and adjust if necessary.
6. Check the function and settings of the monitor collimator display; adjust if necessary.

⚠ WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Safety information and protective measures".

- ⇒ If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.

Spellman I.I. mini voltage supply

NOTE

The illustration shows the Spellman I.I. mini voltage supply installed in a 9" image intensifier. This is irrelevant to replacement, and to the adjustment of voltages.



Fig. 24: 9 inch / 23 cm I.I. with Spellman I.I. mini power supply

- Pos. 1 Mounting screws
- Pos. 2 Plugs E1 to E3, Penning and anode
- Pos. 3 Ribbon cables
- Pos. 4 DIP switches
- Pos. 5 Test points

1. Remove the cover on the I.I..
2. Replace the I.I. mini-voltage supply.
3. Refer to the I.I. test certificate 1 for the E1/E2/E3 and A voltages. Check and adjust them as necessary according to the "Voltages" chapter.
4. Check the functions and adjustments of the collimator. Readjust them, if necessary.
5. Check the display functions and the setting of the blades on the monitor. Adjust them, if necessary.
6. Check the overall resolution according to the IQ test.
7. Perform the IQ test.

⚠ WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Safety information and protective measures".

- ⇒ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing the camera and the I.I. optics

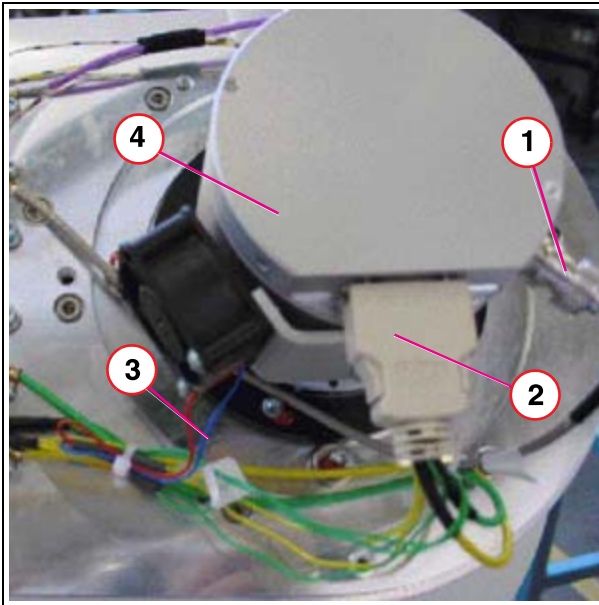


Fig. 25: II _ Connection

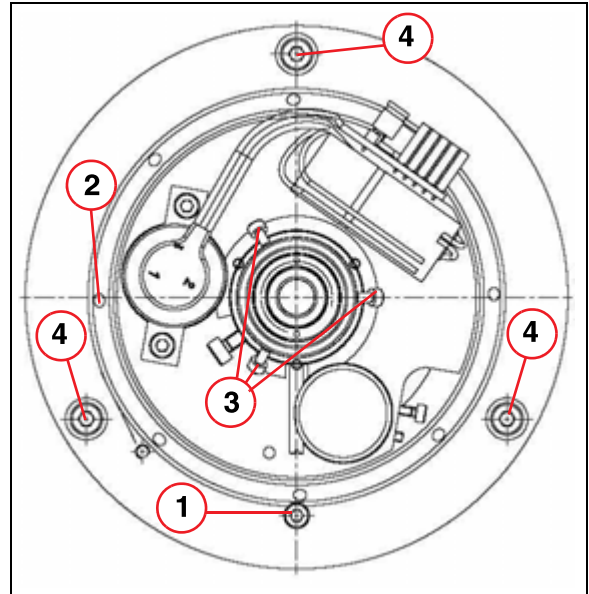


Fig. 26: Replacing the camera and I.I. optics

Removing/replacing the camera

1. Switch the system off.
2. Remove the upper I.I. cover (already removed in (Fig. 25 / p. 51)).
3. Unplug the connectors (1/Fig. 25 / p. 51), (2/Fig. 25 / p. 51) and disconnect the fan wires (3/Fig. 25 / p. 51).
4. Loosen the clamping screw (1/Fig. 26 / p. 51).
5. Rotate the clamping ring (2/Fig. 26 / p. 51) a half rotation in the counterclockwise direction to loosen the camera. For this purpose, insert an Allen key (2.5 mm) into the hole (2/Fig. 26 / p. 51) and push the clamping ring in the counterclockwise direction.
6. Remove the 3 Allen screws (3/Fig. 26 / p. 51).
7. Turn the entire camera (4/Fig. 25 / p. 51) counterclockwise until it is no longer attached. For subsequent reinstallation, count the number of turns when removing the camera. The connector (2/Fig. 25 / p. 51) should be in the position shown in (Fig. 25 / p. 51).
8. Install the (new) camera in reverse order.
9. Adjust the camera and I.I. optics.
10. Perform the IQ test.
11. Complete the country-specific acceptance (§16 partial acceptance... /DHHS...).

Removing/replacing the I.I. optics

Prerequisites: Camera must already be removed.

1. Remove the 3 M4 screws (4/Fig. 26 / p. 51).
2. Remove the I.I. optics.
3. Install the (new) optics and camera in reverse order.
 - ⇒ When screwing in the 3 M4 screws (4/Fig. 26 / p. 51), make sure that the optic is pushed against the centering bolts.
4. Adjust the camera and I.I. optics.
5. Perform the IQ test.

 WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**
-

Adjusting the camera and I.I. optics

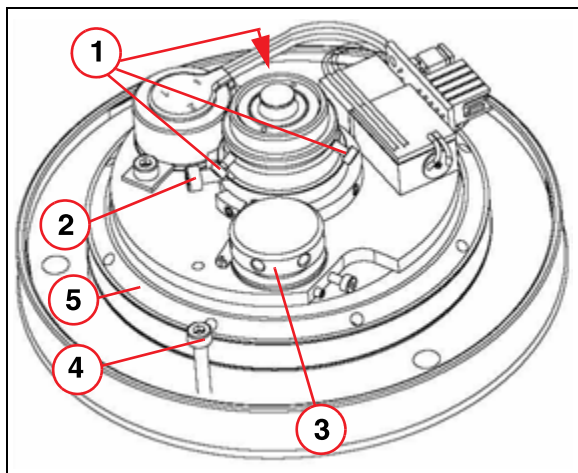


Fig. 27: Adjusting the camera

Centering the camera

NOTE

The camera can be centered by moving the optics. Centering is performed in the factory and should be acceptable. The camera optics must be moved toward the centering bolts.

Adjustment reproduction scale

Prerequisites: Camera centering should be OK.

1. Loosen the clamping screw (4/Fig. 27 / p. 53).
2. Loosen the lock ring (5/Fig. 27 / p. 53).
3. Unplug the connectors (1/Fig. 25 / p. 51), (2/Fig. 25 / p. 51) and disconnect the fan wires (3/Fig. 25 / p. 51).
4. Remove the 3 Allen screws from the camera flange (1/Fig. 27 / p. 53).
5. You can increase/decrease the image size by turning the entire camera. The camera plugs must not be in the same position.
 - ⇒ Turn clockwise = larger image
 - ⇒ Turn counter clockwise = smaller image
6. Rotate the camera until the plugs are at the same location prior to the adjustment and re-tighten the 3 M2 Allen screws (1/Fig. 27 / p. 53).
 - ⇒ Tightening torque **14 ± 1Ncm**
7. Tighten the lock ring (5/Fig. 27 / p. 53).
8. Retighten the clamping screw (4/Fig. 27 / p. 53).
9. Reattach the connectors (1/Fig. 25 / p. 51), (2/Fig. 25 / p. 51) and the fan wires (3/Fig. 25 / p. 51).





10. Release fluoro and check the image size. Repeat the adjustment if necessary.
11. Open the service application and adjust the 0-degree position of the image.
Path: <Service>-<Main System>-<Adjustment>-<Image Rotation>.
12. Perform the IQ test.

Camera focus

Prerequisites: Camera reproduction scale should be OK.



1. Loosen the focus ring clamping screw (2/Fig. 27 / p. 53).
2. You can adjust the optimum sharpness by turning the focus ring (3/Fig. 27 / p. 53).
3. Release fluoro and check the sharpness. Repeat the adjustment if necessary.
4. Retighten the focus clamping screw (2/Fig. 27 / p. 53).
5. Perform the IQ test.

NOTE

Adjusting the camera focus also has a slight effect on the reproduction scale. The reproduction scale adjustment may have to be repeated.

WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed. See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.

Basic unit control panel

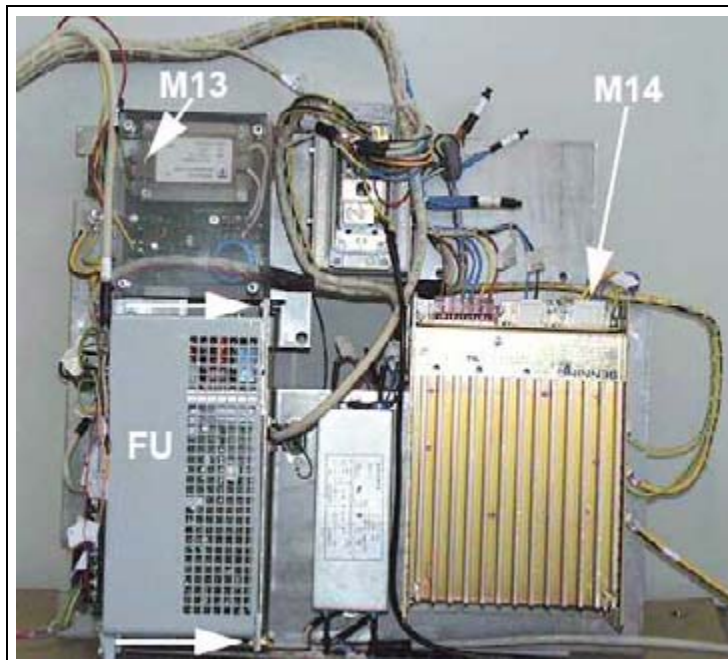


Fig. 28: FU

1. Disconnect the plugs for the control panel from board D1.
2. Remove the cable clip of the cable to the control panel.
3. Remove the Allen screws on the fastening ring (swivel joint of the control panel).
4. Replace the control panel.
5. Reinstall the fastening ring.
6. Reconnect the cable.
7. Reattach the cable clip.
8. Perform a functional test of the control panel.

Frequency converter FU (vertical lift)



Electrical voltage!

If ignored, death or serious physical injury can occur.

⇒ **Switch the system power supply off.**

1. Remove the cover over the plug board / terminal board of the frequency converter.
2. Disconnect the power plug.
3. Remove the cable clips and cable ties at and in front of the frequency converter.
4. Disconnect all the cables on the frequency converter.
5. Remove the jumper FU.PTC - FU.UKZ on the new frequency converter. The jumper is not required.
6. Replace the frequency converter after removing the Allen screws ([Fig. 28 / p. 55](#)).
7. Reconnect all cables.
8. Reconnect the power plug.
9. Re-secure the cables with cable ties.
10. Reattach the cables with the cable clips.
11. Perform a functional test of the lifting column movement.

Replacing the power supply assembly

⚠ WARNING

Electrical voltage!

See chapter 1, Safety Information.

⇒ Switch system power supply off, disconnect the power plug, and disconnect all power plugs from the UPS.

NOTE

The power supply assembly is programmed to 230V AC mains voltage. Ensure that the new power supply is programmed to the local mains voltage value and the fuses F1 and F2 are changed to the correct value, as printed in the circuit diagram of the system.

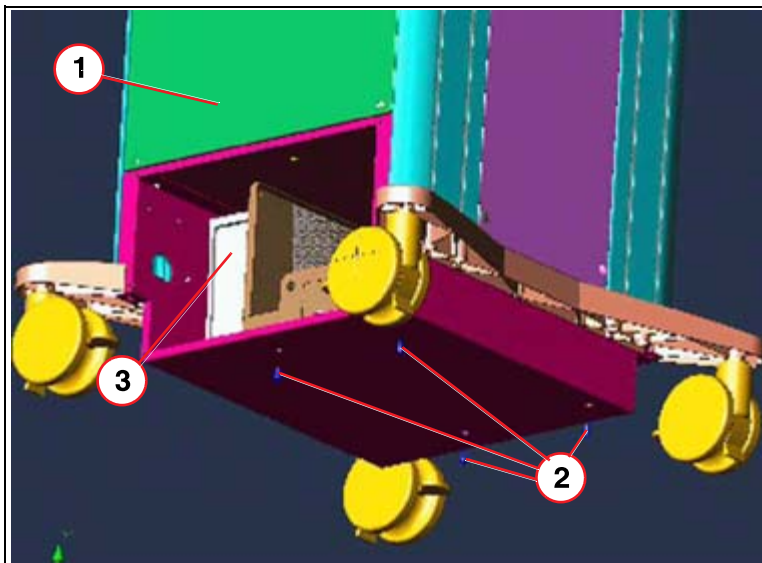


Fig. 29: Power supply

1. Switch off the system.
2. Remove the system power plug.
3. Disconnect all UPS power plugs (input and output plugs).
4. Unscrew the 4 screws from the back cover and remove the cover (1/Fig. 29 / p. 57)
5. Unscrew the 6 screws from the lower back cover and remove the cover (cover already removed in (Fig. 29 / p. 57)).
6. Unscrew the 4 Allen screws (2/Fig. 29 / p. 57) for the power supply component.

7. Pull the power supply component about 10 cm out of the trolley.

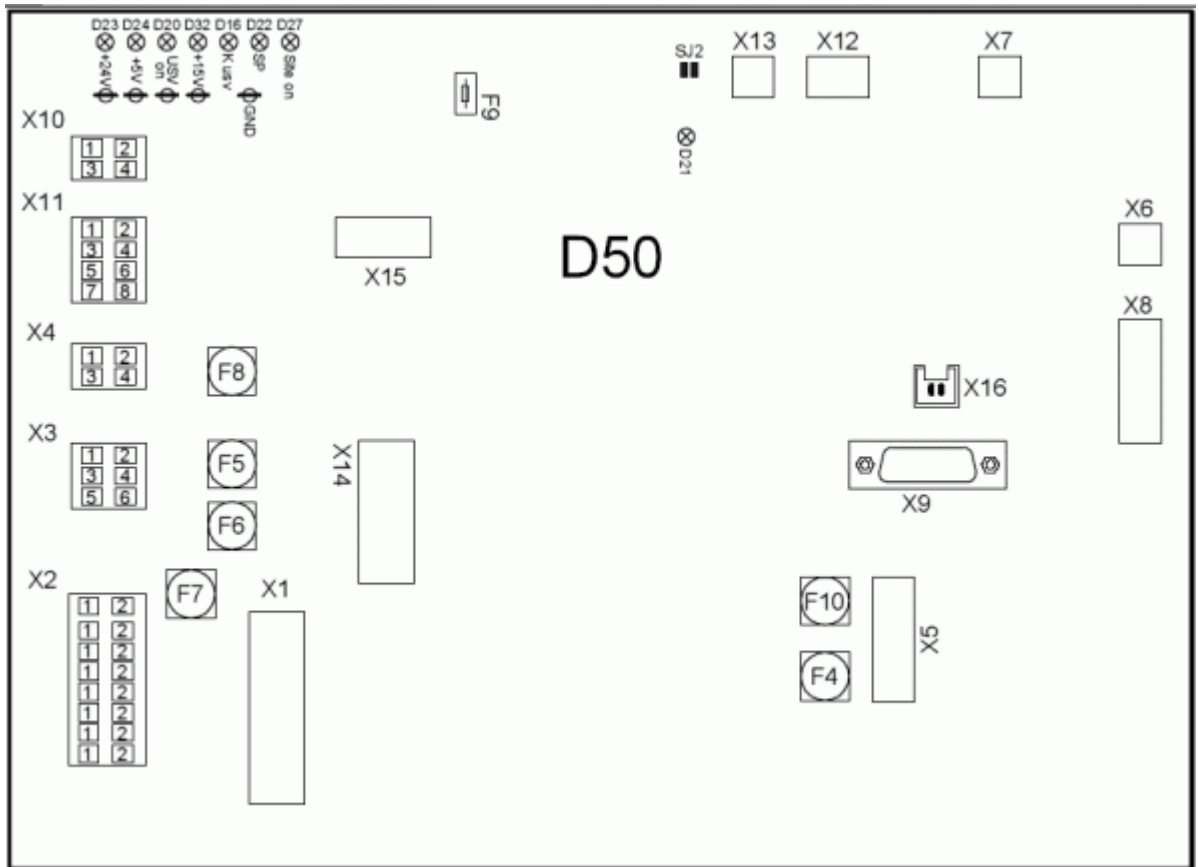


Fig. 30: D 50

8. Disconnect the power line at connector D50 X 11
 - ⇒ Live Monitor - X 11.2 blue / X11.5 brown
 - ⇒ Imaging System (PC) - X 11.3 blue / X11.6 brown
 - ⇒ UPS output - X 11.1 blue / X 11.4 brown
9. Disconnect the power line at connector D50 X 2
 - ⇒ Reference Monitor - X 2.1 blue / X 2.2 brown
 - ⇒ Paper Printer (option) - X 2.1 blue / X 2.2 brown
10. Disconnect the power line at connector D50 X 4
 - ⇒ UPS input - X 4.2 blue / X 4.3 brown
11. Disconnect the display unit cable at connector D50 X 3
 - ⇒ X 3.1 = green / x 3.2 = red / X 3.3 = yellow / X 3.4 = black / X 3.5 = violet / X 3.6 = blue
12. Disconnect the ground wires coming from the monitor trolley and monitor cable.
13. Unplug D50 X6, X7, X8, X9, X12, and the X13 connector.
14. Unplug PC connectors D 66 X4 (BNC) and D66 X5 ([Fig. 36 / p. 67](#)) and pull these cables down.
15. Remove the cable clamps from the SG cable and the power cable.

16. Disconnect and pull the SG cable and the power cable out from the power supply assembly.
17. Remove the power supply component from the monitor trolley.
18. Program the mains voltage of the new power supply assembly (transformer T1 and T2) to the local mains voltage value.
19. Check the fuse values of fuses F1 and F2.
 - ➡ If needed, replace them with fuses with the correct values for the programmed local mains voltage value (100 V AC to 127 V AC: 20 A slow blow / 200 V AC to 240 V AC: 15 A slow blow, see wiring diagram of the system).
20. Install the new power supply component in reverse order.
21. Reconnect all power plugs to the UPS.
22. Switch on the system and perform a functional test.

Replacing the UPS

WARNING

Electrical voltage!

See chapter 1, Safety Information.

- ⇒ Switch system power supply off, disconnect the power plug, and disconnect all power plugs from the UPS.

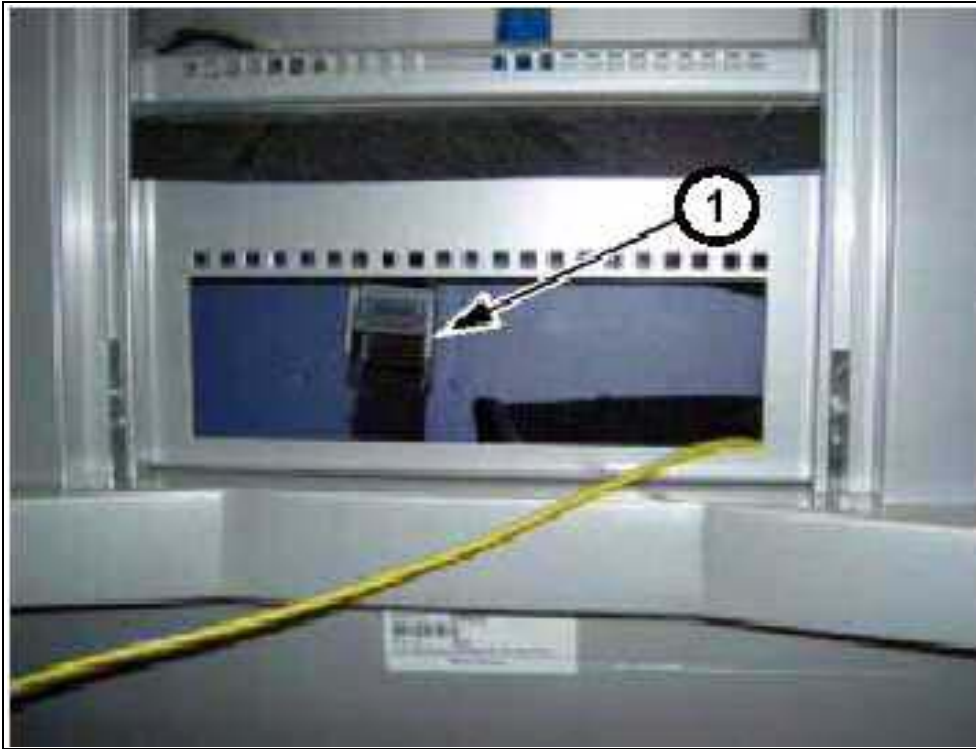


Fig. 31: Replacing the UPS_2

1. Remove the back cover from the monitor trolley.
2. Disconnect all power plugs from the UPS.
3. Loosen the tension band (1/Fig. 31 / p. 60) and remove the UPS from the monitor trolley. Side covering was already removed in (Fig. 31 / p. 60).
4. Switch off the UPS by pressing the power switch.

NOTE

UPS MGE type 850: To switch the UPS off or on, the power switch needs to be pressed for > 2 seconds.

5. Switch on the new UPS at its power switch.
6. Install the new UPS component in reverse order.
7. Switch on the system and perform a functional test.

NOTE

For correct functionality of the UPS, the new battery should be charged for approx. 8 hours. If possible and after all service tasks are performed, switch the system off, but leave the monitor trolley connected to the mains voltage wall socket. As long as the power plug of the monitor trolley is plugged into the mains voltage wall socket, the UPS battery will be charged.

Replacing the UPS battery

⚠ WARNING

Electrical voltage!

See chapter 1, Safety Information.

- ⇒ Switch system power supply off, disconnect the power plug, and disconnect all power plugs from the UPS.

⚠ CAUTION

Risk of burns and destruction of the battery component due to possible high short-circuit current!

Wearing metal objects such as rings, watches, or bracelets, and using tools with uninsulated handles during procedures can lead to a short-circuit of the battery contacts. This can destroy the battery component and can heat up the metal objects, causing a short-circuit at very high temperatures.

- ⇒ Before servicing the battery components, remove watches, rings, bracelets and all other metal objects from the hands and arms, use tools with insulated handles.

UPS MGE Type 800

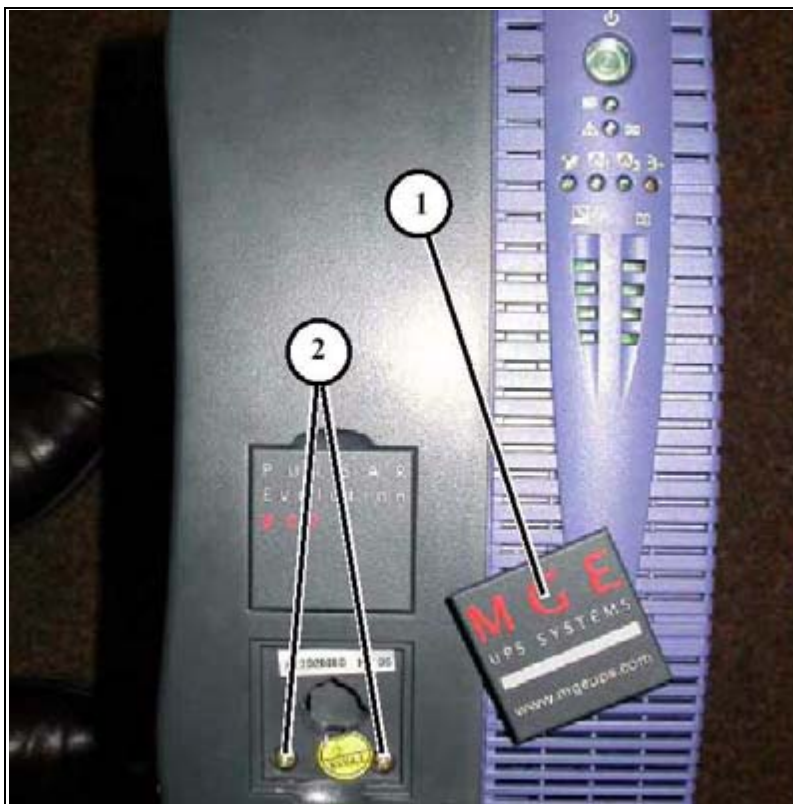


Fig. 32: Replacing the UPS_battery_1



Fig. 33: Replacing the UPS_battery_2

1. Disconnect all power plugs from the UPS.
2. Remove the UPS from the monitor trolley.
3. Switch off the UPS by pressing the power switch on the UPS.
4. Remove the “MGE UPS Systems” plastic cover (1/Fig. 32 / p. 62) from the UPS.
5. Unscrew the 2 slotted grub screws (2/Fig. 32 / p. 62) from the UPS and remove the front cover.
6. Disconnect the connector (1/Fig. 33 / p. 63) and pull the battery out of the slot.
7. Insert the new battery into the UPS.
8. Connect the battery connector in front of the battery.

NOTE

Make sure that the battery connector contacts are not bent when plugged in! Check the contact (1/Fig. 33 / p. 63) if the system does not switch on .

9. Install the UPS front cover and fasten it with the screws.
10. Install the UPS “MGE UPS Systems” plastic cover.
11. Switch on the UPS by pressing the power switch on the UPS.
12. Insert the UPS component in reverse order into the monitor trolley.

NOTE

For correct functionality of the UPS, the new battery should be charged for approx. 8 hours. If possible and after all service tasks are performed, switch the system off, but leave the monitor trolley connected to the mains voltage wall socket. As long as the power plug of the monitor trolley is plugged into the mains voltage wall socket, the UPS battery will be charged.

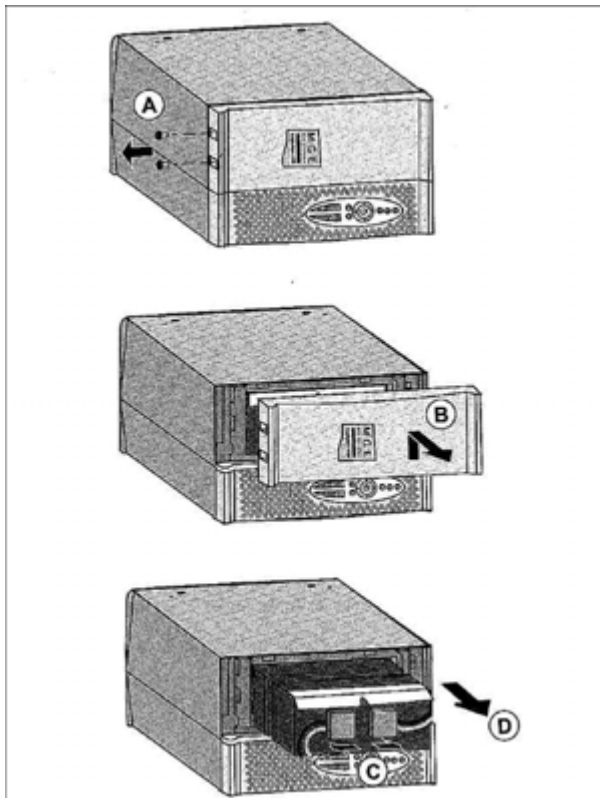
MGE UPS Type 850

Fig. 34: UPS MGE 850 Battery change

1. Disconnect all power plugs from the UPS.
2. Remove the UPS from the monitor trolley.
3. Switch off the UPS by pressing the power switch at the UPS for more than 2 seconds.
4. Lay the UPS on its side, as shown in (Fig. 34 / p. 64).
5. Remove the 2 screws on the bottom of the UPS, as shown in A, (Fig. 34 / p. 64).
6. Lift up and pull up the front cover, as shown in B, (Fig. 34 / p. 64).
7. Disconnect the battery connector in front of the battery and pull the battery out of the slot.
8. Insert the new battery into the UPS.
9. Connect the battery connector in front of the battery.

NOTE

Make sure that the battery connector contacts are not bent when plugged in! Check the contact ([1/ Fig. 33 / p. 63](#)) if the system does not switch on .

10. Install the UPS front cover and fasten it with the screws.
11. Switch on the UPS by pressing the power switch on the UPS for more than 2 seconds.
12. Insert the UPS component in reverse order into the monitor trolley.

NOTE

For correct functionality of the UPS, the new battery should be charged for approx. 8 hours. If possible and after all service tasks are performed, switch the system off, but leave the monitor trolley connected to the mains voltage wall socket. As long as the power plug of the monitor trolley is plugged into the mains voltage wall socket, the UPS battery will be charged.

Replacing the keyboard

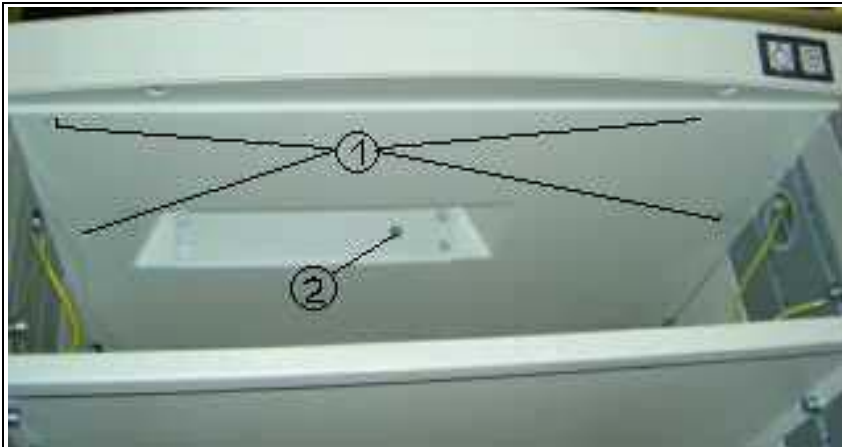
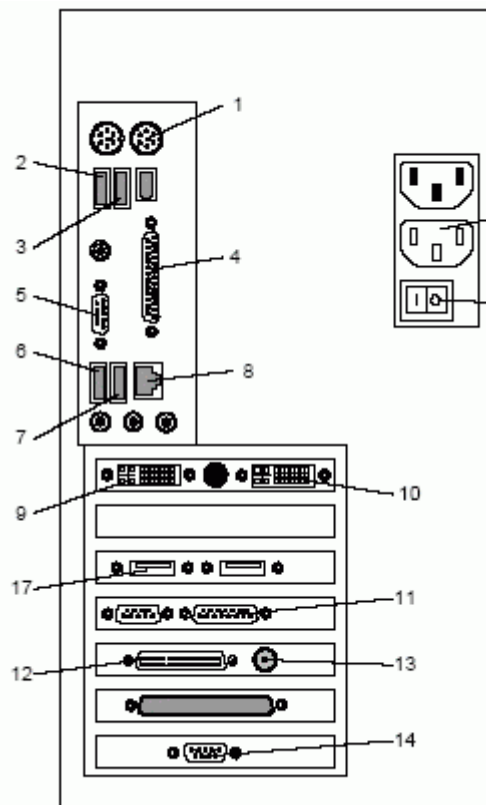


Fig. 35: Replacing the keyboard_3

1. Remove the 4 screws ([1/Fig. 35 / p. 66](#)).
2. Lift the keyboard upward and out of the monitor trolley.
3. Unplug the keyboard connectors.
4. Install the new keyboard in reverse order.
5. Perform a functional test.

Replacing the PC



Connection

- 1 UPS control
- 2 Keyboard
- 3 Mouse
- 4 Printer connection - parallel
- 5 COM 1
- 6 Dongle
- 7 Printer connection - USB
- 8 LAN connector
- 9 Monitor B
- 10 Monitor A
- 11 M50 D20 X9
- 12 D66 X5
- 13 D66 X4 (Gigalink)
- 14 Adapter plug COM1
- 15 Net plug (only M420 / 430)
- 16 On/off switch (only M420/430)
- 17 CAN converter (option)

Fig. 36: PC rear

1. Save patient data and create a backup if possible.
2. Switch off the system and remove the system power plug.
3. Unscrew the 6 screws from the back cover (1/Fig. 29 / p. 57) and remove the cover.
4. Unplug all cable connections from the PC (Fig. 36 / p. 67).
5. Loosen the tension belt from the PC.
6. Remove the old PC and insert the new PC.
7. Reconnect all PC plugs (Fig. 36 / p. 67).

NOTE

All plugs must be connected as shown in the above figure for software installation to be successful (see (Fig. 36 / p. 67)).

8. Switch on the system and install the software according to the "System Software Installation" instructions.
9. Perform a functional test and an IQ Quick test.

⚠ WARNING

Once these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed. See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.
-

Replacing PC covers

Opening the casing

PC M420 and 430

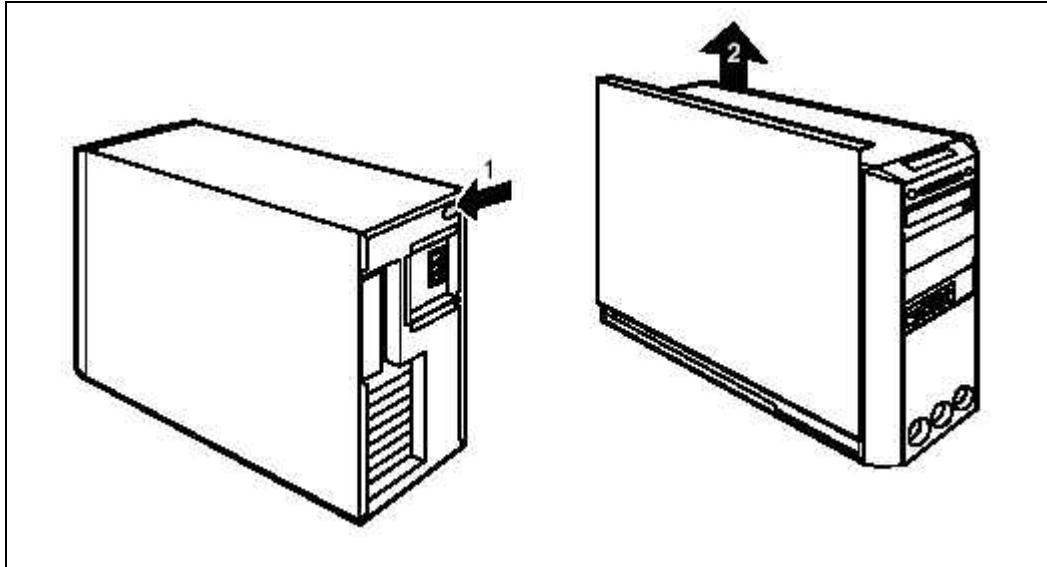


Fig. 37: Remove PC covers

1. Switch off the system.
2. Pull the power plug out of the power outlet.
3. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
4. Press the green unlocking button on the back of the casing ([1/ Fig. 37 / p. 69](#)).
5. Hold the green unlocking button depressed and slide the casing side cover upwards in the direction of the arrow ([2/ Fig. 37 / p. 69](#)).
6. Pull the side cover out of the casing.

PC M450

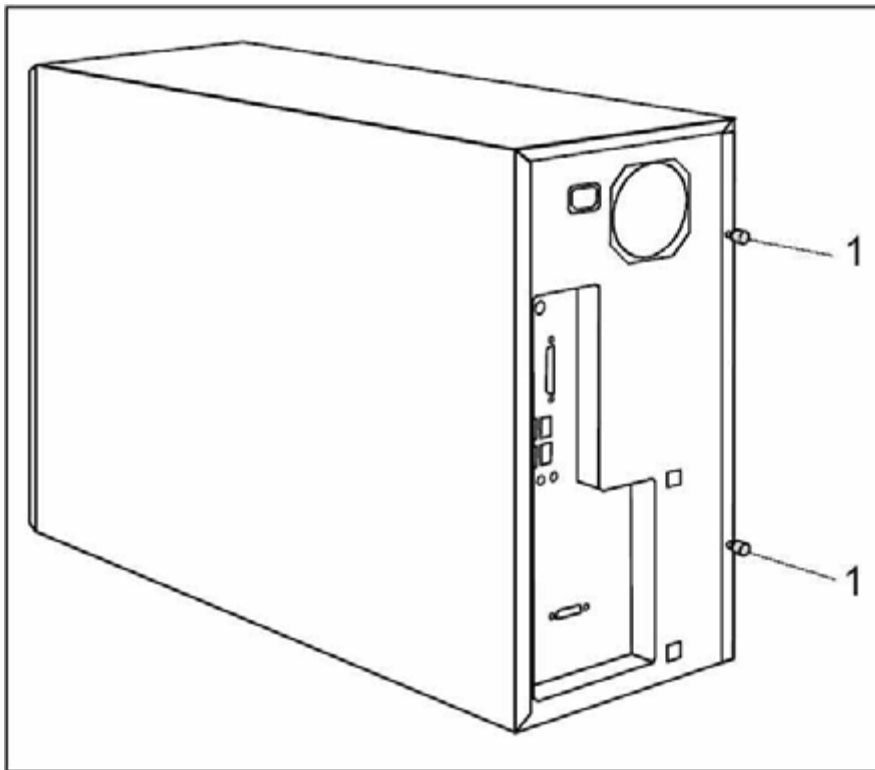


Fig. 38: Remove PC cover_a M450_

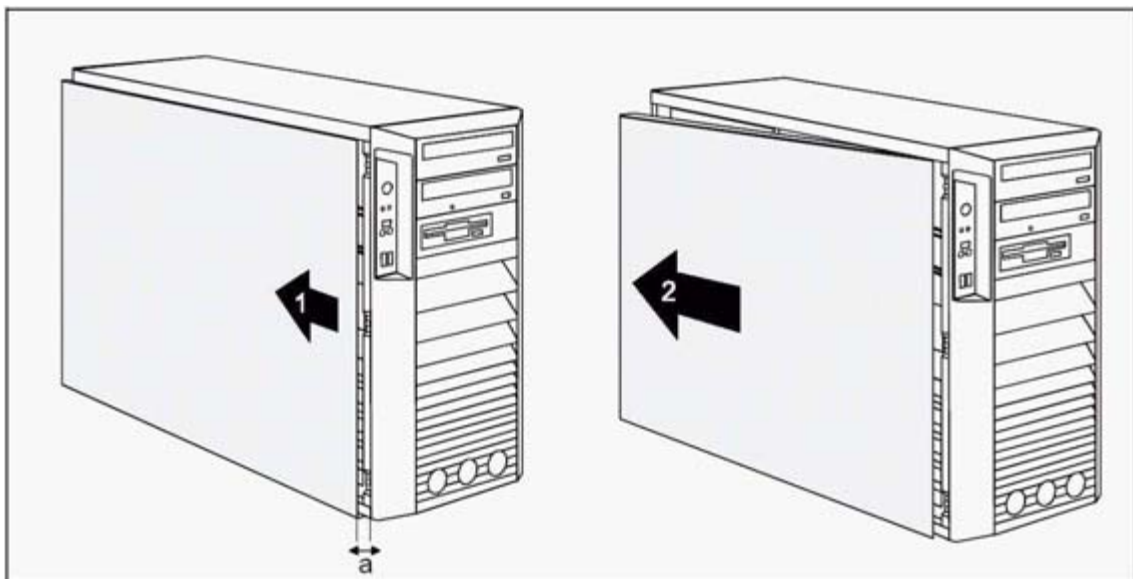


Fig. 39: Remove PC cover_b M450_

1. Switch off the system.
2. Pull the power plug out of the power outlet.
3. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
4. Unscrew the two knurled screws ([1/ Fig. 38 / p. 70](#)) on the back of the casing.
5. Slide the side cover approximately 2 cm ([a/ Fig. 39 / p. 70](#)) in the direction of the arrow ([1/ Fig. 39 / p. 70](#)), until the stop.

6. Pull the side cover in the direction of the arrow (2/ Fig. 39 / p. 70) of the casing.

Removing the front panel

PC M420 and M430

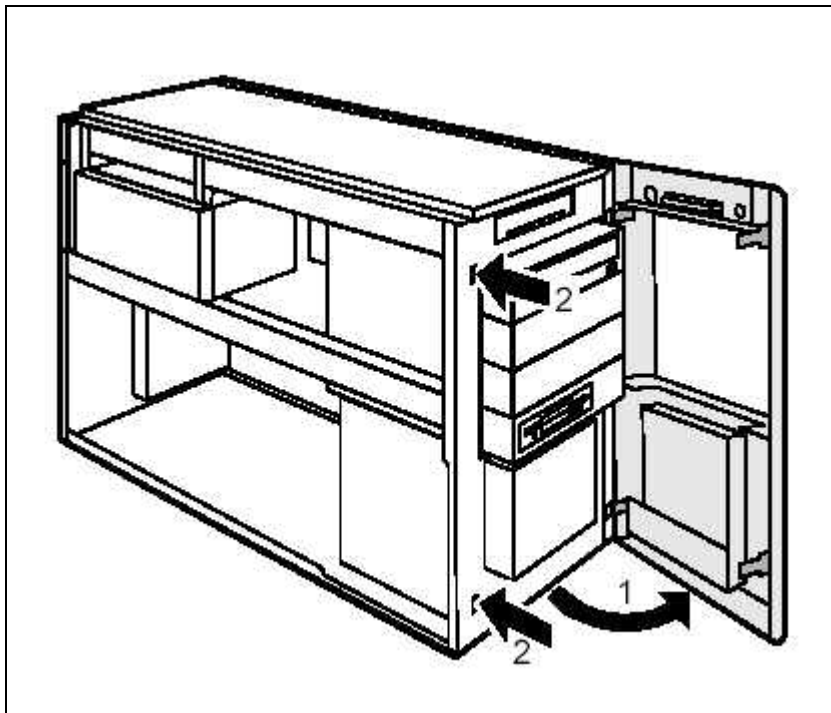


Fig. 40: Removing the front panel

1. Replace the PC on the monitor trolley (Replacing the PC / p. 67).
2. Open the casing (Opening the casing / p. 69).
3. Detach the unlocking lever (2/ Fig. 40 / p. 71) and open the front panel (1/ Fig. 40 / p. 71).
4. Detach the plastic hook from the front panel of the casing and carefully remove the front panel. If you pull too hard, you may loosen or damage the LCD cable.
5. The LCD cable is long enough so that you can carefully place it to one side with the front panel. You do not need to unplug the cable before removing the front panel.

PC M450

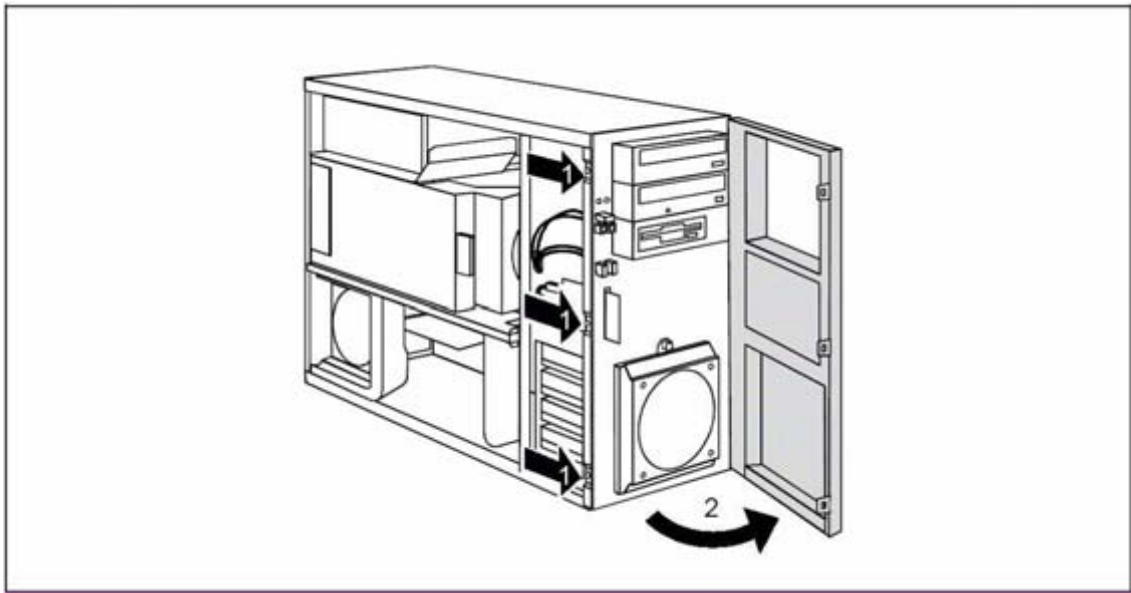


Fig. 41: Opening the front panel M450_

1. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
2. Open the casing ([Opening the casing / p. 69](#)).
3. Detach the three locking tabs on the left side of the front panel ([1/ Fig. 41 / p. 72](#)).
4. Fold open the front in the direction of the arrow ([2/ Fig. 41 / p. 72](#)).
5. If necessary, detach the pivot axle on the right-hand side of the front panel from the casing and carefully remove the front panel.

Replacing the drive

PC M420 and M430

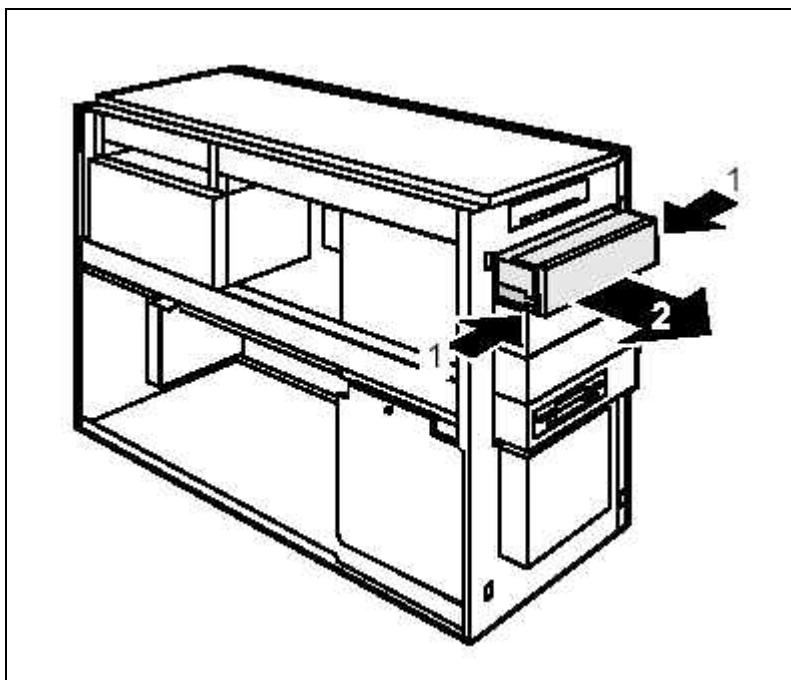


Fig. 42: Replacing the drive

1. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
2. Open the casing ([Opening the casing / p. 69](#)).
3. Remove the front ([Removing the front panel / p. 71](#)).
4. Disconnect the data and the power supply connectors from the drive.
5. Press the rails (1/Fig. 42 / p. 73) together and pull the drive out of the casing (2/Fig. 42 / p. 73).
6. Push the new drive into the casing until the rails engage.
7. Plug the data and the power supply connectors into the drive. Make sure the polarity is correct.
8. Attach the front panel in reverse order.
9. Close the casing in reverse order.
10. Reinstall the PC in reverse order and reconnect the PC plugs (see ([Fig. 36 / p. 67](#))).
11. Perform a functional test.



PC M450

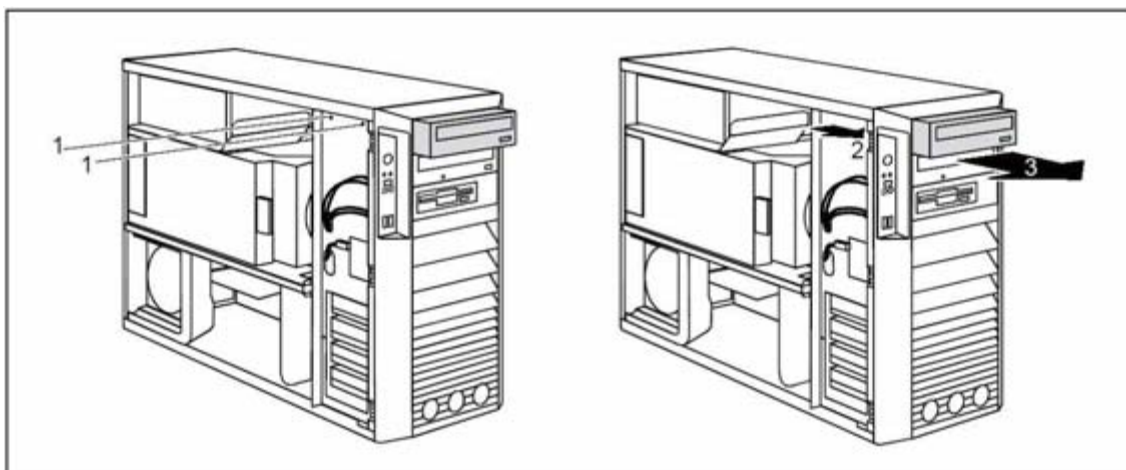


Fig. 43: Replacing the drive M450_

1. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
2. Open the casing ([Opening the casing / p. 69](#)).
3. Remove the front ([Removing the front panel / p. 71](#)).
4. Disconnect the data and the power supply connectors from the drive.
5. Loosen the screws ([1/ Fig. 43 / p. 74](#)).
6. Slide the drive out of the bay in the direction of the arrow ([2/ Fig. 43 / p. 74](#)) from behind. The drive now extends slightly out of the casing.
7. Slide the drive out of the casing ([3/ Fig. 43 / p. 74](#)).
8. Push the new drive into the casing until the rails engage.
9. Plug the data and the power supply connectors into the drive. Make sure the polarity is correct.
10. Attach the front panel in reverse order.
11. Close the casing in reverse order.
12. Reinstall the PC in reverse order and reconnect the PC plugs (see ([Fig. 36 / p. 67](#))).
13. Perform a functional test.



Replacing the lithium battery

Prerequisite: The software installation CD / DVD for the system (includes BIOS installation) must be available.

PC M420 and M430

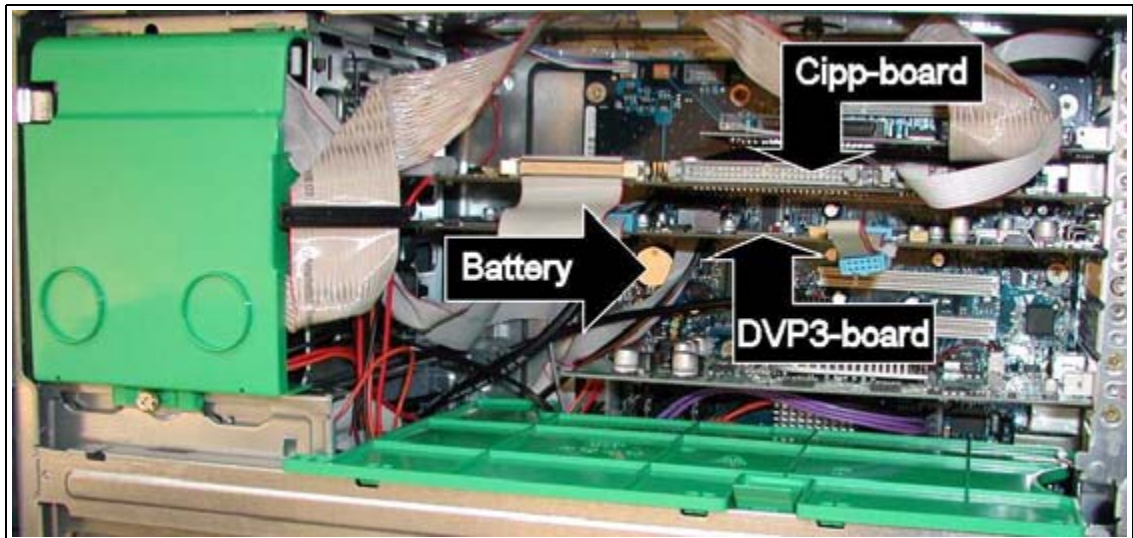


Fig. 44: Replacing the lithium battery_1

PC M450

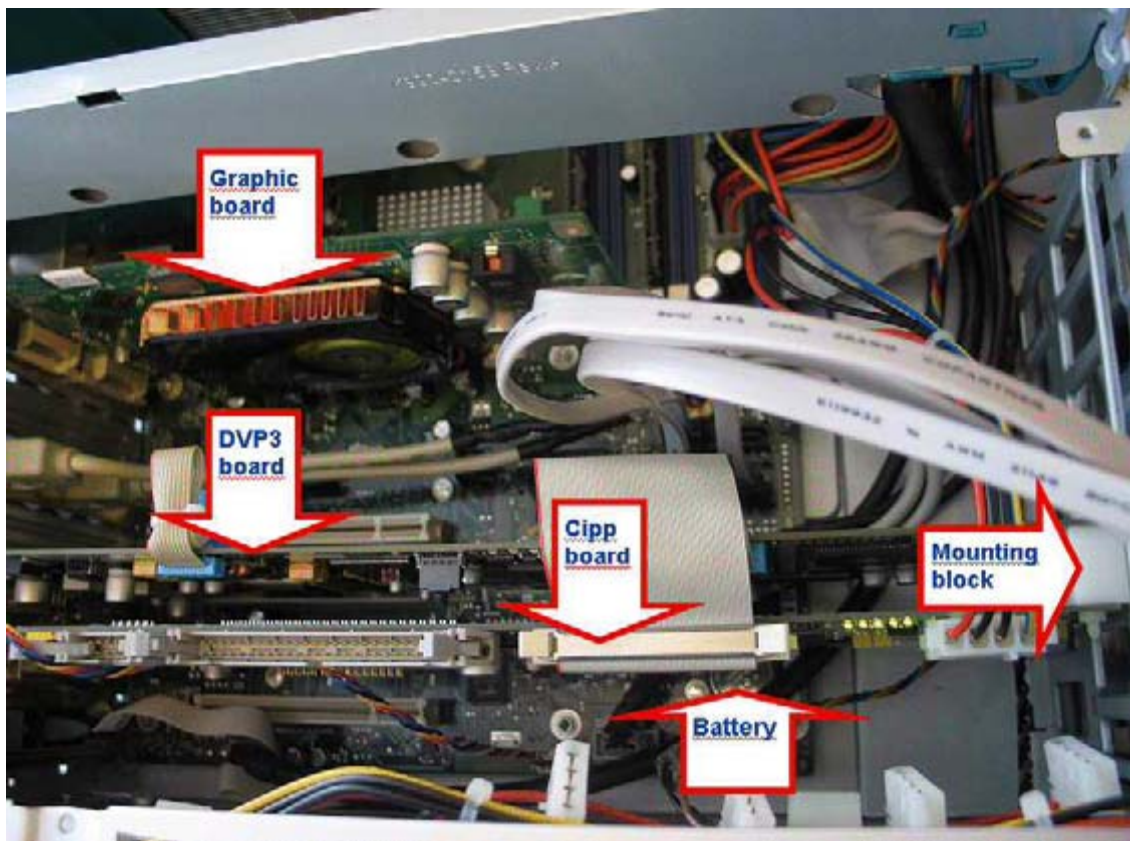


Fig. 45: Components M450_

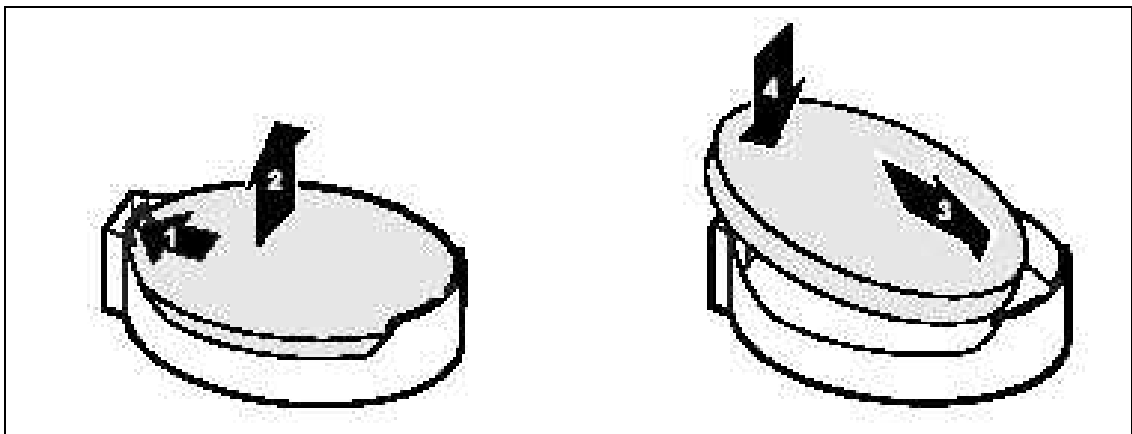


Fig. 46: Replacing the lithium battery

NOTE

In order to permanently save the system information, a lithium battery is installed to provide the CMOS memory with current. An appropriate error message notifies the user when the charge is too low or the battery is empty. The lithium battery must be replaced.

Incorrect replacement of the lithium battery may lead to a risk of explosion!

The lithium battery may be replaced only by an identical battery or a type recommended by the manufacturer.

Make sure that you insert the battery correctly. The plus pole must be on top!

Do not touch the minus pole of the battery with your finger. Use gloves or a cotton cloth to insert the battery.



1. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
2. Open the casing ([Opening the casing / p. 69](#)).
3. Press the locking lug in the direction of the arrow ([1/Fig. 46 / p. 76](#)); the battery jumps slightly out of the holder ([2/Fig. 46 / p. 76](#)).
4. Remove the battery M420/ M430 ([Fig. 44 / p. 75](#)) or M450 ([Fig. 45 / p. 76](#)) and follow the "Disposal Instructions" for disposing of the old battery.
5. Push the new lithium battery of the identical type into the holder ([3/Fig. 46 / p. 76](#)) and press it downward until it engages ([4/Fig. 46 / p. 76](#)).
6. Reinstall the casing in reverse order.
7. Reinstall the PC in reverse order and reconnect the PC plugs (see ([Fig. 36 / p. 67](#))).

Restoring BIOS settings (necessary after battery replacement)

NOTE

When the battery is empty, the BIOS is set to default and the first boot device is the CD-ROM drive.

In addition to activating the system on/off switch, the following may be necessary ->

- Turn off the PC via the power switch on the back panel of the PC.
- Turn on the PC via the back power switch and press the button on the front panel of the PC.
- If the system is unintentionally switched off during BIOS installation, it may be necessary to press the reset key ([2/Fig. 35 / p. 66](#)) with a pin shaped object.

NOTE

At this time a restore of the BIOS settings is only possible together with the complete software installation procedure.

--> Perform the software installation according to the instructions SPR2-310.816.02...

Replacing a PCI board for PC M420 and M430 (e. g. CIPP board)

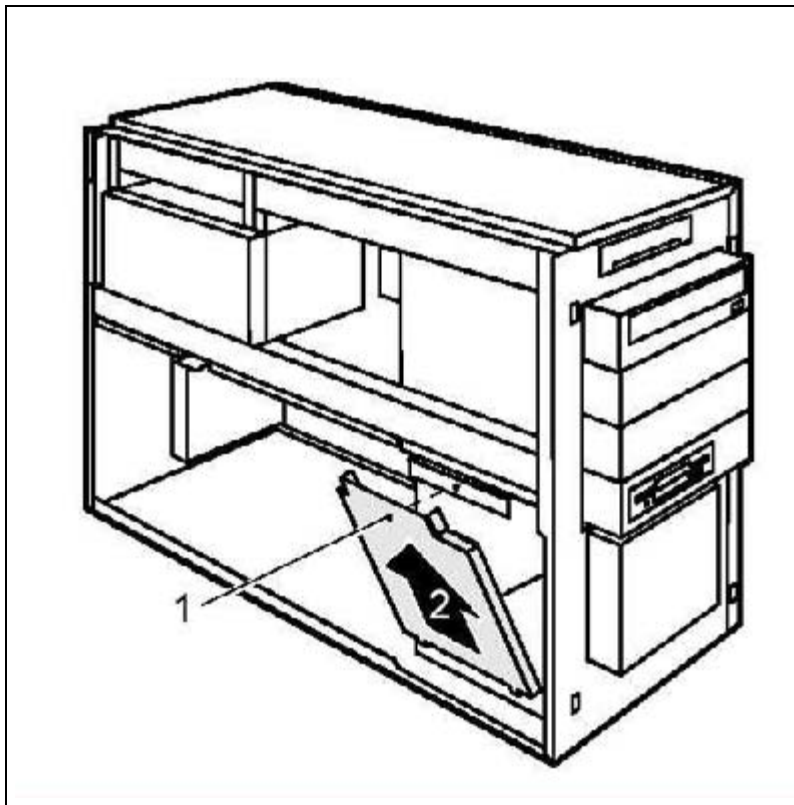


Fig. 47: Replacing a PCI board_1

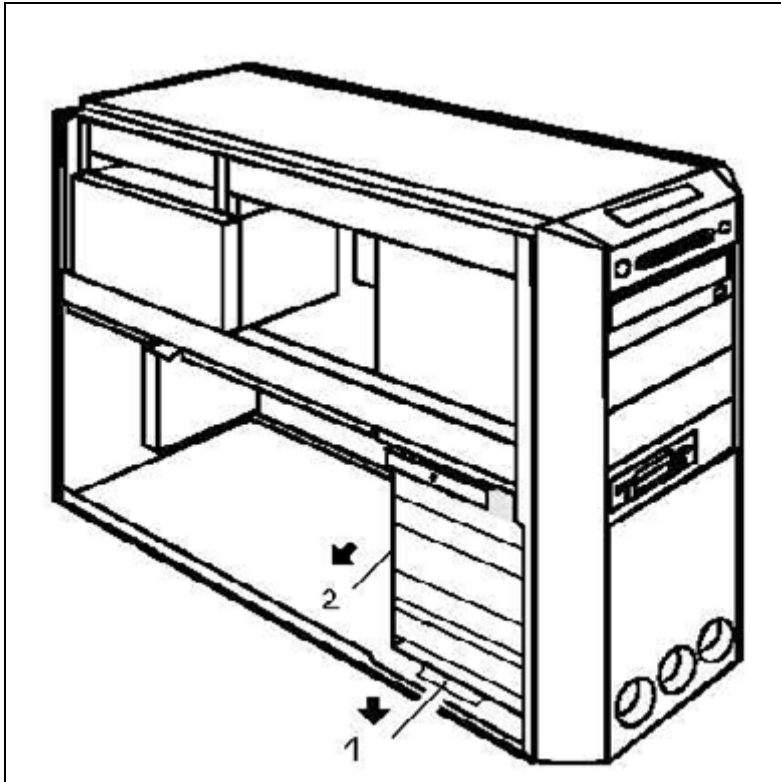


Fig. 48: Replacing a PCI board_2

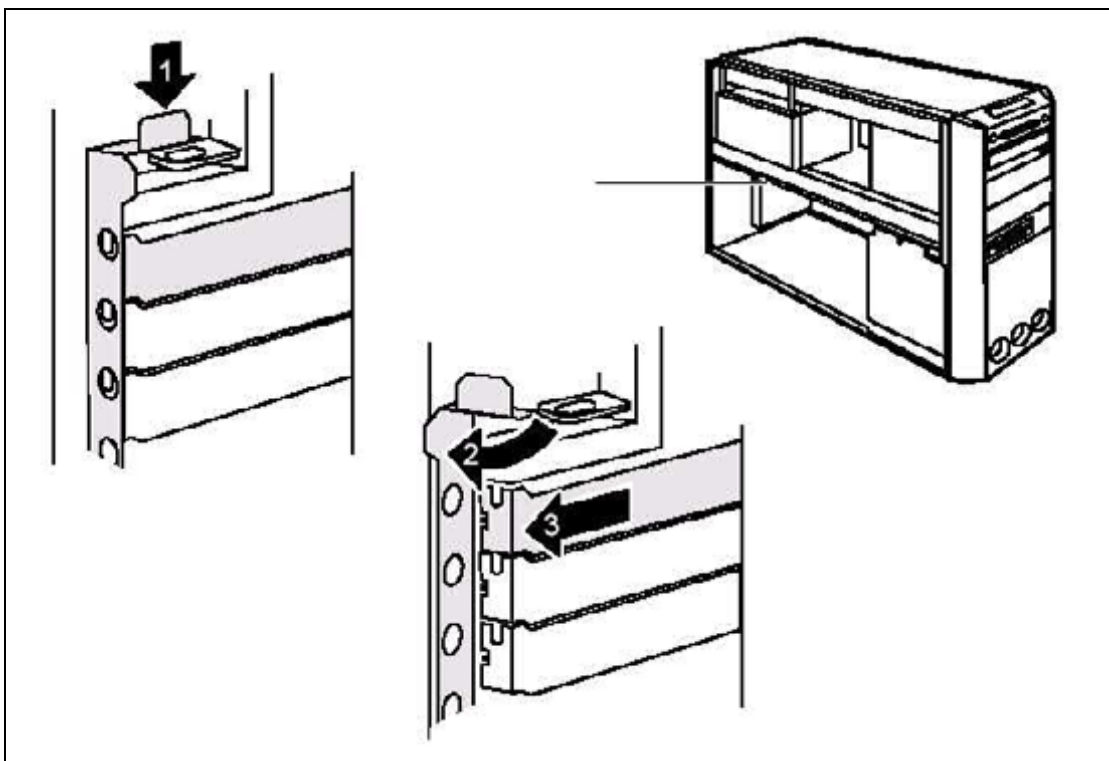


Fig. 49: Replacing a PCI board_3

NOTE

Work steps 1 through 6 are only necessary for a long design of a PCI board (e.g. CIPP board) (see [\(Fig. 44 / p. 75\)](#))

See ARCADIS spare parts list for which boards are released for field exchange.



1. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
2. Open the casing ([Opening the casing / p. 69](#)).
3. Loosen the screw ([1/Fig. 47 / p. 79](#)).
4. Fold out the cover ([2/Fig. 47 / p. 79](#)).
5. Disconnect the data and power supply cables to the hard disk drive.
6. Press the locking bar ([1/Fig. 48 / p. 80](#)) downward and pull the hard drive casing ([2/Fig. 48 / p. 80](#)) out of the PC.
7. Press the unlocking mechanism ([1/Fig. 49 / p. 80](#)) downward and open the locking rail ([2/Fig. 49 / p. 80](#)). The word "PRESS" is embossed on the unlocking mechanism.
8. Remove the locking screws from the relevant slot.
9. Disconnect the connectors from the PCI board.
10. Remove the board from the slot ([3/Fig. 49 / p. 80](#)).
11. Take the new board out of its packaging and install it in reverse order.
12. Reinstall the casing in reverse order.
13. Reinstall the PC in reverse order and reconnect the PC plugs (see [\(Fig. 36 / p. 67\)](#)).
14. Perform a functional test and an IQ Quick test.



⚠ WARNING

Once these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.

Replacing a PCI board for PC M450 (e. g. CIPP board)

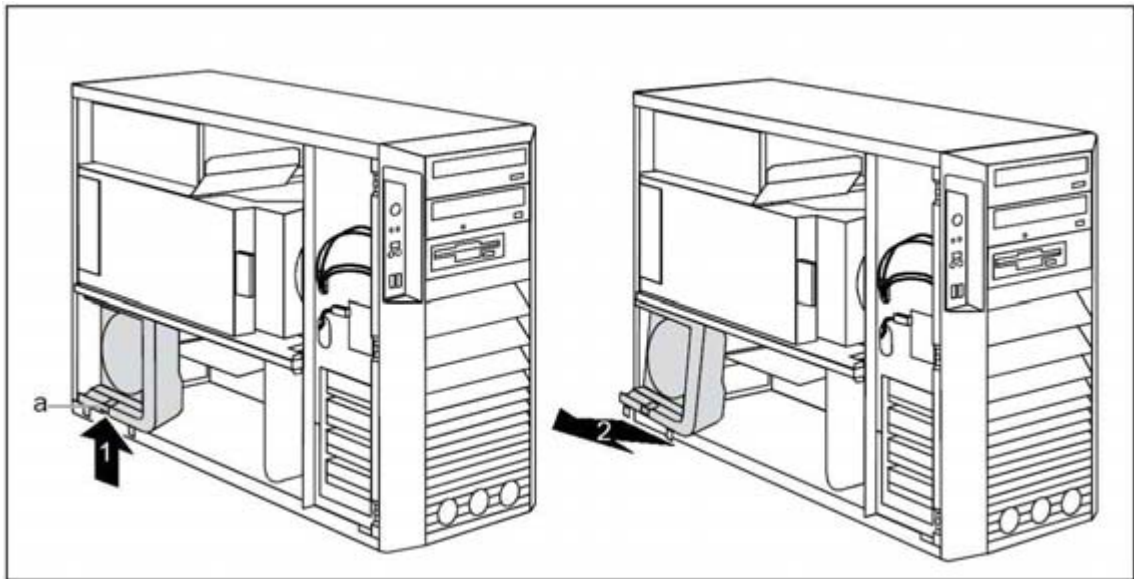


Fig. 50: Removing the side fan M450_

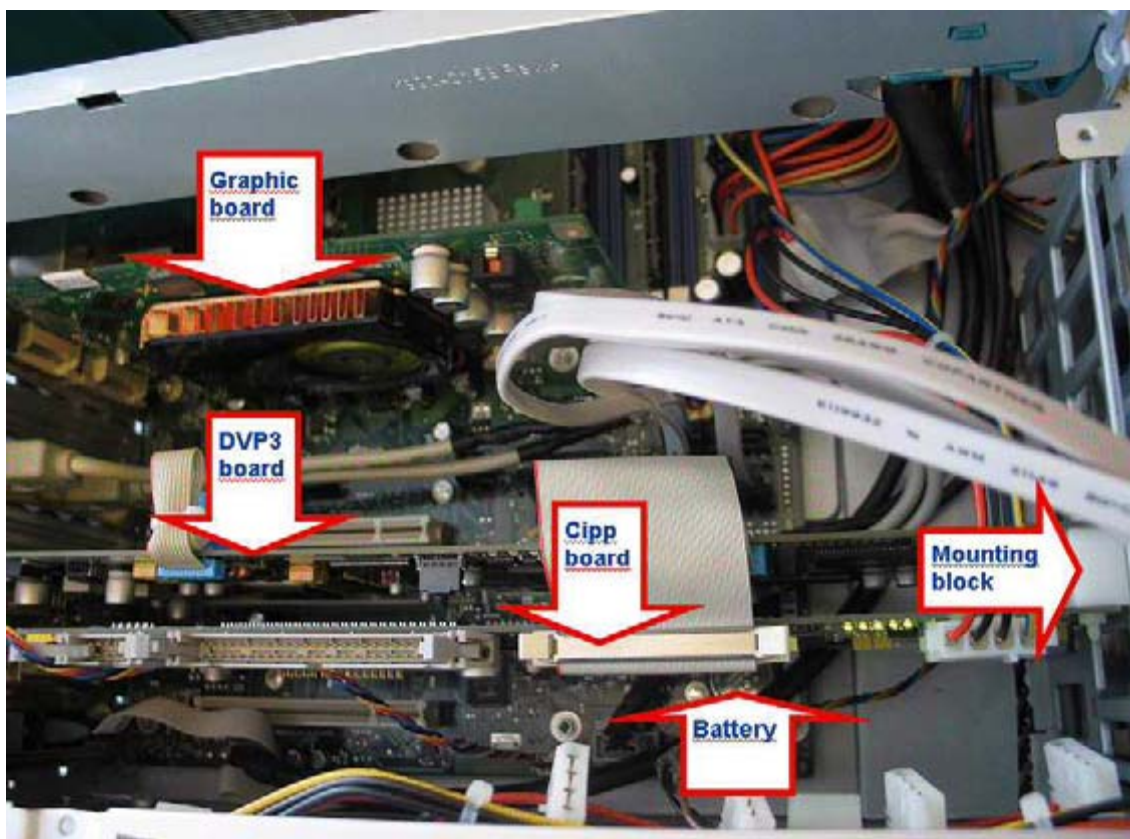


Fig. 51: Components M450_

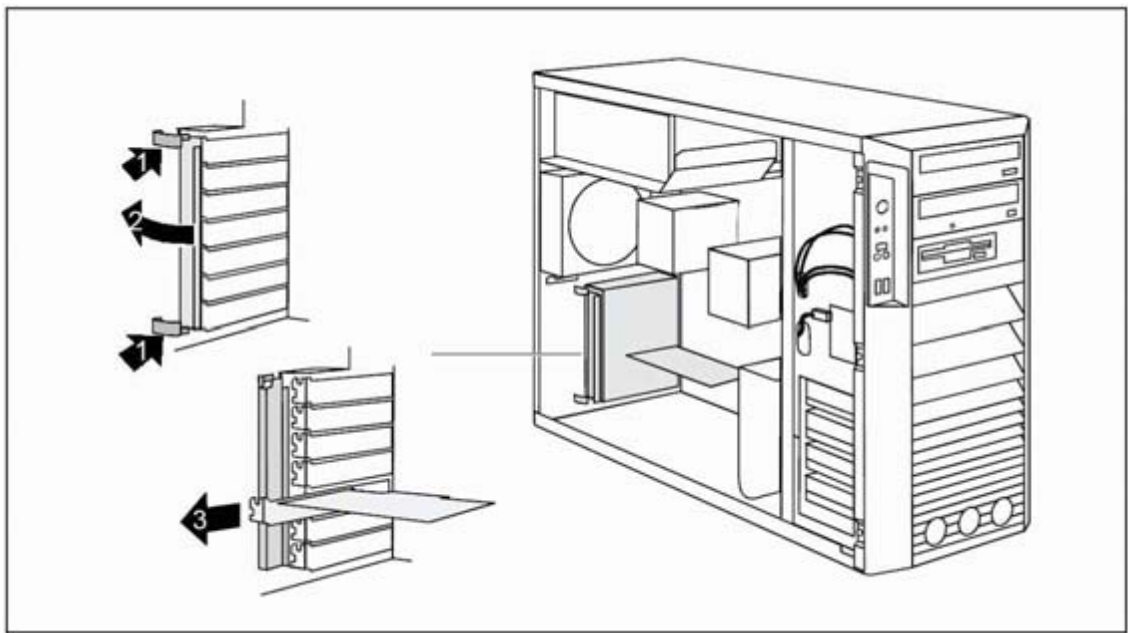


Fig. 52: Replacing a PCI board M450_



1. Replace the PC on the monitor trolley ([Replacing the PC / p. 67](#)).
2. Open the casing ([Opening the casing / p. 69](#)).
3. Release the side fan by pressing the locking hook ([a/ Fig. 50 / p. 82](#)) in the direction of the arrow ([1/ Fig. 50 / p. 82](#)).
4. Pull the bottom edge of the side fan in the direction of the arrow ([2/ Fig. 50 / p. 82](#)) out of the casing.
5. Disconnect the cable of the fan from the main board and remove the side fan.
6. Remove the mounting block ([mounting block/ Fig. 51 / p. 82](#))
7. Press on the clips ([1/ Fig. 52 / p. 83](#)) in the direction of the arrow and unhook them from the casing rear panel.
8. Fold open the locking rail in the direction of the arrow ([2/ Fig. 52 / p. 83](#)).
9. Disconnect the connectors from the PCI board.
10. Remove the board from the slot ([3/ Fig. 52 / p. 83](#))
11. Take the new board out of its packaging and install it in reverse order.
12. Reinstall the casing in reverse order ([Fig. 37 / p. 69](#)).
13. Reinstall the PC in reverse order and reconnect the PC plugs (see ([Fig. 36 / p. 67](#))).
14. Perform a functional test and an IQ Quick test.

⚠ WARNING

Once these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed. See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.
-

Replacing or installing a double USB slot for PC M420 and M430 (optional for CAN converter)

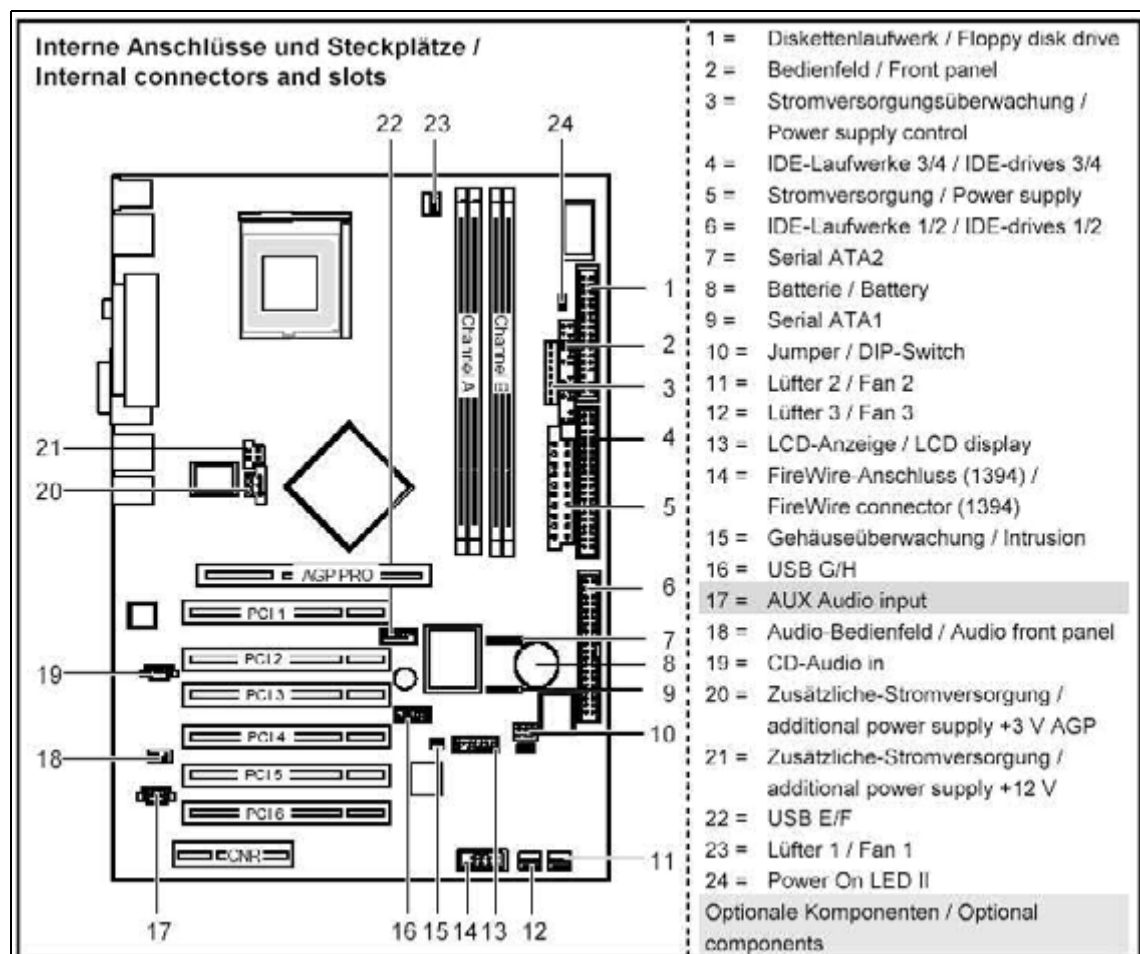


Fig. 53: Replacing or installing a double USB slot_1



Fig. 54: Replacing or installing a double USB slot_2

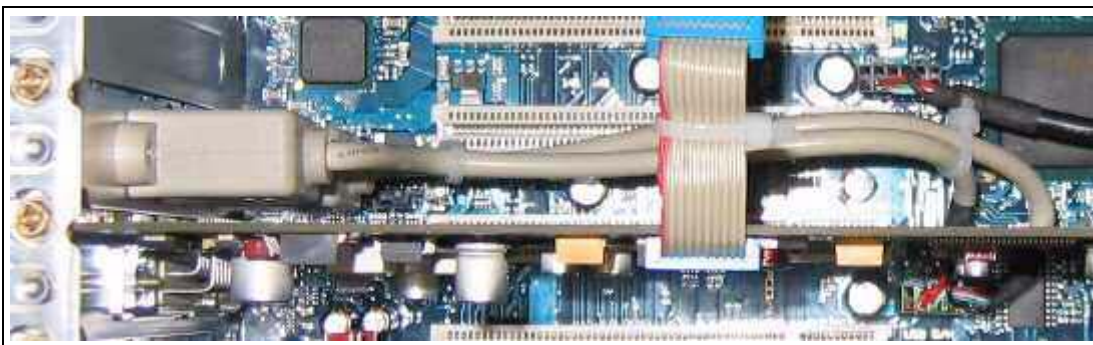


Fig. 55: Replacing or installing a double USB slot_3



1. Open the casing ([Opening the casing / p. 69](#)).
2. Press the unlocking mechanism ([1/Fig. 49 / p. 80](#)) downward and open the locking rail ([2/Fig. 49 / p. 80](#)). The word "PRESS" is embossed on the unlocking mechanism. .

NOTE

Slot 3 should be used for the double USB assembly.

3. Replace the DVP3 board ([Fig. 44 / p. 75](#)) according to ([Replacing a PCI board for PC M420 and M430 \(e. g. CIPP board\) / p. 79](#)).
4. Disconnect the connector USB G/H ([16/Fig. 53 / p. 85](#)) from the main board ([Fig. 53 / p. 85](#)).
5. Reinstall the double USB connector in the slot assembly.
6. Position and connect the USB cable as shown in ([Fig. 55 / p. 86](#)).

NOTE

The cable position must be as shown in Fig. (Fig. 54 / p. 86) and Fig. (Fig. 55 / p. 86).

NOTE

Make sure that the distance between the graphic board fan and the USB cable is fixed.

7. Reinstall the DVP3 board in reverse order.
8. Reinstall the casing in reverse order (Fig. 37 / p. 69).
9. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 36 / p. 67)).
10. Perform a functional test.

Low voltages

From test point	To test point	Voltage	Adjuster
D1.X37 (0 V)	D1.X30 (+5 V)	+5.1 V to +5.2 V	M14. +5 V/adj.
D1.X39 (0 V)	D1.X32 (+15 V)	+14.9 V to +15.1 V	M14. +15 V/adj.
D1.X39 (0 V)	D1.X33 (- 15 V)	-14.8 V to -15.2 V	M14. -15 V/adj.
D30.X1.8 (0 V)	D30.X1.9 (+24 V)	+24.0 V to +29.5 V	Not adjustable
D30.X21.1 (0 V)	D30.X21.10 (+24 V)	+22.8 V to +29.5 V	Not adjustable
D30.X20.1 (0 V)	D30.X20.3 (+27 V)	+27.3 V to +27.8 V	D30 R115
M13.S- (0 V)	M13.S+ (+13 V)	+13.1 V to +13.3 V	M13.TR1

Image intensifier voltages

I.I. mini-voltage supply HV2000

Voltage	Test point	Potentiometer	Test Certificate Reference voltage	Voltage divider ratios
U1	TP1	P1	E1	1:100
U2	TP2	P2	E2	1:1000
U3	TP3	P3	E3	1:10000
UA (30 kV)	TPA	PA	A	1:10000
GND (0V)	TPG	n.a.	n.a.	n.a.

WARNING

After the electrode voltages are adjusted, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.

Spellman I.I. mini voltage supply

The E1/E2/E3 and A voltages may be taken from the I.I. test protocol and checked or adjusted on the basis of the control test points listed in table 3.

Tab. 1 Test points and voltage divider ratio

Voltage	Test point	Test point Ground (0V)	Voltage divider ratio
E1	TP1	TP G	1:100
E2	TP2	TP G	1:200
E3	TP3	TP G	1:3333
Penning	TP P	TP G	1:1000
Anode	TP A	TP G	1:10000

Adjustment

Tab. 2 DIP switches

DIP Switches	1	2	3	4
Normal status	ON	OFF	OFF	OFF
Adjustment E1 (U1)	ON	OFF	ON	OFF
Adjustment E2 (U2)	ON	ON	OFF	OFF
Adjustment E3 (U3)	ON	ON	ON	OFF

NOTE

DIP switch 1:

Pos. OFF = 25kV anode voltage, not adjustable Pos. ON = 30 kV anode voltage, not adjustable.

For the ARCADIS I.I. types, dip switch 1 must always be set to the position "ON" (= 30 kV anode voltage).

1. Before performing the voltage adjustment for one of the electrodes, set the corresponding DIP switches to the position described in the "DIP switches" table and connect a digital multimeter to the correct test points, described in the "Test points and voltage divider ratio" table.
 2. According to the activated DIP switch, adjust the E1, E2 or E3 value by using the "Adjustment" potentiometer.
 3. After the correct voltage is adjusted, switch off the corresponding DIP switches.
 - ⇒ The adjusted voltage value for this electrode is stored.
- If needed, set the DIP switches for the next electrode adjustment and adjust the next electrode voltage.
 - If needed, select the next I.I. zoom format and repeat the voltage adjustments for the electrodes E, E2 and E3 for the I.I. zoom format.

WARNING

After the electrode voltages are adjusted, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

- ⇒ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Monitor trolley voltages

Voltage for	Test point	Voltage	Comments
Generator	X3.1 -- X3.2	200 V ~ to 215 V ~	To main system
Generator	X3.5 -- X3.6	230 V ~ to 246 V ~	To main system
ASPIA PC, live monitor	X11.1 -- x11.4	230 V ~ to 246 V ~	From UPS output
Reference monitor, Paper printer	X2.1 -- X2.2	230 V ~ to 246 V ~	Paper printer = option
UPS input	X4.2 -- X4.3	230 V ~ to 246 V ~	Supply voltage

Brake forces / brake torques

Measuring the horizontal movement forces



Fig. 56: C_bow_

The attachment point for the spring scale is the end of the railing on the l.l. side and/or the handgrip of the horizontal carriage. Always pull along the direction of movement at a constant speed.

- ⇒ The maximum force for moving the horizontal carriage at a constant rate when the brakes are released is 115 N.

⇒ When the brakes are applied, the force must be $> 180 \text{ N}$.

Measurement A - B:

Pull on the handgrip of the horizontal unit (2/Fig. 56 / p. 92).

Test points after 30, 170 and 200 mm.

Measurement B - A:

Pull on the railing on the I.I. side (1/Fig. 56 / p. 92).

Test points after 30, 170 and 200 mm.

Measuring the horizontal swivel forces

⇒ Torque when the brakes are released max. 55 Nm.

⇒ Torque when the brakes are applied $> 100 \text{ Nm}$.

C-arm vertical, the attachment point is the end of the railing on the I.I. side (see Fig. 1).

The distance from the fulcrum / axis to the attachment point is 60 cm. Maximum force to be applied = $55 \text{ Nm} / 0.6 \text{ m} = 92 \text{ N}$.

Measuring the orbital movement forces

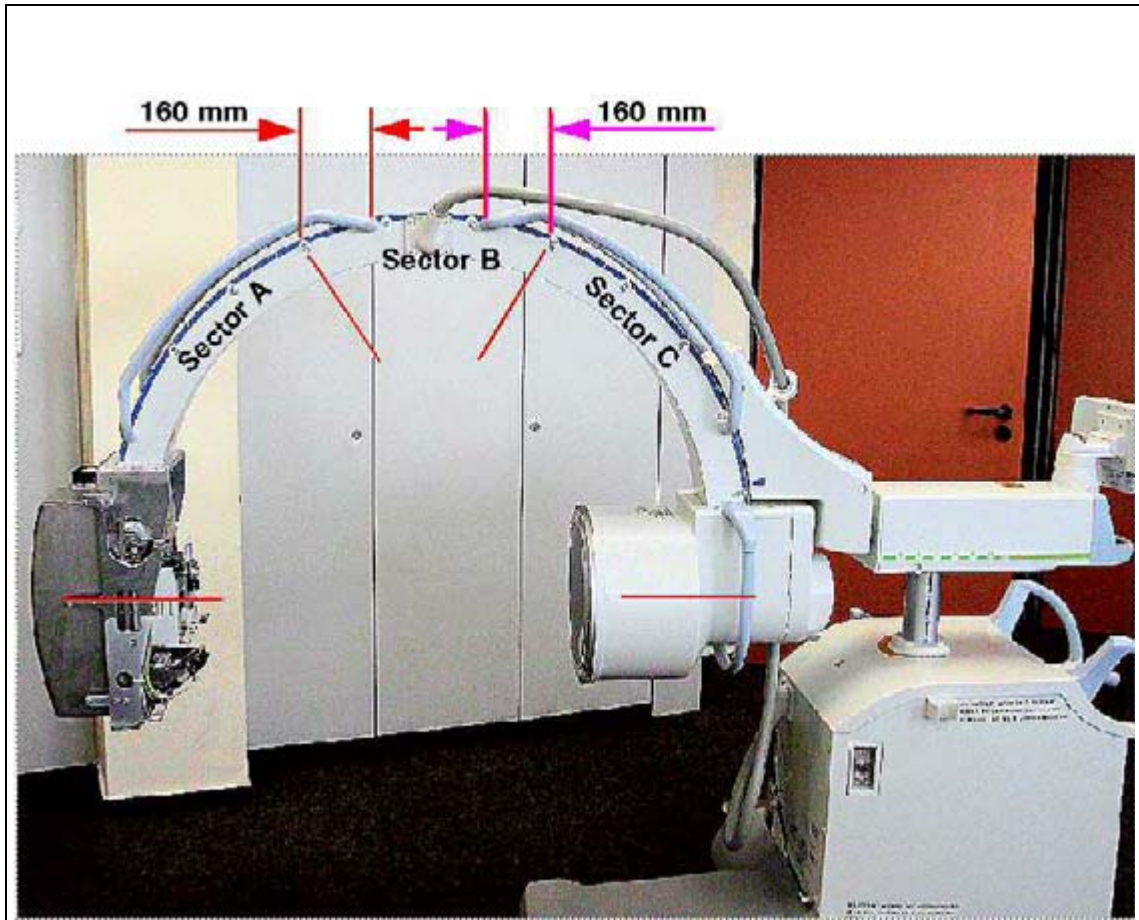


Fig. 57: Torques

The attachment point for the spring scale is the end of the railing on the I.I. side in sector B. Always pull along the C-arm at a constant speed.

Movement when brakes are released

- ⇒ With the C-arm in vertical position, the force used to move the C-arm at a constant rate must not exceed 85 N.
- ⇒ With the C-arm in horizontal position, the force used to move the C-arm at a constant rate must not exceed 120 N.
- ⇒ When brakes are applied, the force required for movement when the C-arm is in the vertical position is $> 85 \text{ Nm}$

Measurement A-C:

Start at 90° (I.I.), pull with spring scale to -90° (single tank).

The C-arm opening faces downward at the start of the measurement.

Measurement C-A:

Start at -90° (single tank), pull with spring scale to 90° (I.I.).

The C-arm opening faces downward at the start of the measurement.

Measuring the angular movement forces

The attachment point for the measurement is the railing next to the I.I., where the C-arm has an orbital position of 0° and an angulation of 0°.

- ⇒ When the brakes are released, the force required for movement is between 10 and 50 N.
- ⇒ When the brakes are applied, the force required for movement must exceed 70 N in order to move the C-arm.

Angulation Brake Magnet

CAUTION
Risk of burn!

⇒ When the angulation brake is released, the brake magnet heats up. Be sure to switch off the power supply and let the brake magnet cool off before touching it.



Fig. 58: Torques_3

1. Remove the cover of the horizontal carriage (see [\(Removing the cover of the horizontal carriage / p. 21\)](#)).
2. Remove the rear cover with the handle for the horizontal lift movement after removing the 4 countersunk screws. The angulation brake magnet is now visible.
3. Remove the cover plate over the C-arm cable guide.
4. Remove the 3 attachment screws and remove the brake magnet ([Fig. 58 / p. 96](#)).

NOTE
Remove both parts of the brake magnet!

5. Remove the plug connection for the brake magnet and insert the new brake magnet.
6. Place the new brake magnet back on the shaft and attach it with the 3 screws ([Fig. 58 / p. 96](#)).
7. Secure the cable with cable ties.
8. Reattach the cover over the C-arm cable guide.
9. Reinstall the cover. Make sure the ground wire is connected properly.
10. Perform a function test of the brake (see "Brake forces / Brake torques").
11. A 30 mm wrench (hexagonal) is required for adjusting the brake.

Horizontal swivel brake



CAUTION

Risk of burn!

⇒ **Releasing the swivel brake causes the brake magnet to heat up. Be sure to switch off the power supply and let the brake magnet cool off before touching it.**

- Swivel brake replacement kit 56 44 955 includes replacement instructions SPR2-230 841.02... Please use these instructions for performing the work steps.

Vertical lift brake

⚠ CAUTION**Risk of burn!**

- ⇒ When the vertical lift brake is released (while lifting or lowering the vertical lift column) the brake magnet heats up. Be sure to switch off the power supply and let the brake magnet cool off before touching it.

⚠ CAUTION**Risk of injury!**

Noncompliance can lead to slight or moderate injuries and/or property damage.

- ⇒ To replace the vertical lift brake, the ARCADIS Avantic must be placed on its side.
- ⇒ This requires 6 people. To avoid damage to the ARCADIS Avantic or the floor, use a suitable floor covering (e.g., woolen blankets or cartons).



Fig. 59: Motor_3



Fig. 60: Motor_2

1. Remove the basic unit cover.
2. Place the ARCADIS Avantic on its side.
3. Remove plug D30.X8 and eject the contacts.
4. Remove the 3 mounting screws for the vertical lift brake and replace the brake.
5. Remove plug D30.X8.
6. Eject the contacts from plug D30.X8.
7. Route the wires of the new vertical lift brake to board D30 and insert the contacts into the plug housing.

Vertical lift motor

⚠ CAUTION**Risk of burn!**

- ⇒ When the vertical lift brake is released (while lifting or lowering the vertical lift column) the brake magnet heats up. Be sure to switch off the power supply and let the brake magnet cool off before touching it.

⚠ CAUTION**Risk of injury!**

Noncompliance can lead to slight or moderate injuries and/or property damage.

- ⇒ To replace the vertical lift motor, the ARCADIS Avantic must be placed on its side.
- ⇒ This requires 6 people. To avoid damage to the ARCADIS Avantic or the floor, use a suitable floor covering (e.g., woolen blankets or cartons).



Fig. 61: Motor_3

1. Remove the vertical lift magnet from the vertical lift motor (3 screws).
2. Remove the attachment screws for the vertical lift motor.
3. Remove the vertical lift motor with the gears from the spindle.
4. Disconnect the wires from the frequency converter FU.
5. Route the wires of the new vertical lift motor to the frequency converter FU and connect them.

6. Place the new motor on the spindle. Make sure the spindle is seated correctly in the gears.
7. Attach the motor with the screws.
8. Install the vertical lift magnet on the vertical lift motor.
9. Return the ARCADIS Avantic to the upright position.
10. Lubricate the spindle and the lifting column mounting.
11. Check the vertical lift function. Also check that the vertical lift motor switches off at the end positions of the vertical lifting column (limit switches).

Vertical lift limit switches

1. Replace the limit switches. Reconnect the wires.
2. To adjust the limit switches, move the lift column **slowly and carefully** until it is positioned just in front of the mechanical end stop.
3. Adjust the respective limit switch and tighten the screws.
4. Make sure the limit switch is functioning correctly.
5. To do this, move back out of the end position.
6. Then **slowly and carefully** move into the end position.
7. The lifting column motor must switch off prior to reaching the end position and the lifting column must come to a full stop.
8. Move the lifting column approximately 10 cm away from the end position.
9. Now move the lift column at full speed in the direction of the end position by pressing and holding the lift column button.
10. The lifting column motor must switch off prior to reaching the mechanical end stop, and the lifting column must come to a full stop.

Lubricating the lifting column parts

- Lubricate the spindle of the lifting column and the mounting of the guide cylinder once a year. If you hear noise during operation, check the lifting column mechanism for damage.

Spindle

- Lubricate the spindle with approx. 10 - 20 ml of "Optimol, Optipit" special-purpose oil. If you hear noise during operation, check the lifting column mechanism for damage.

Guide cylinder

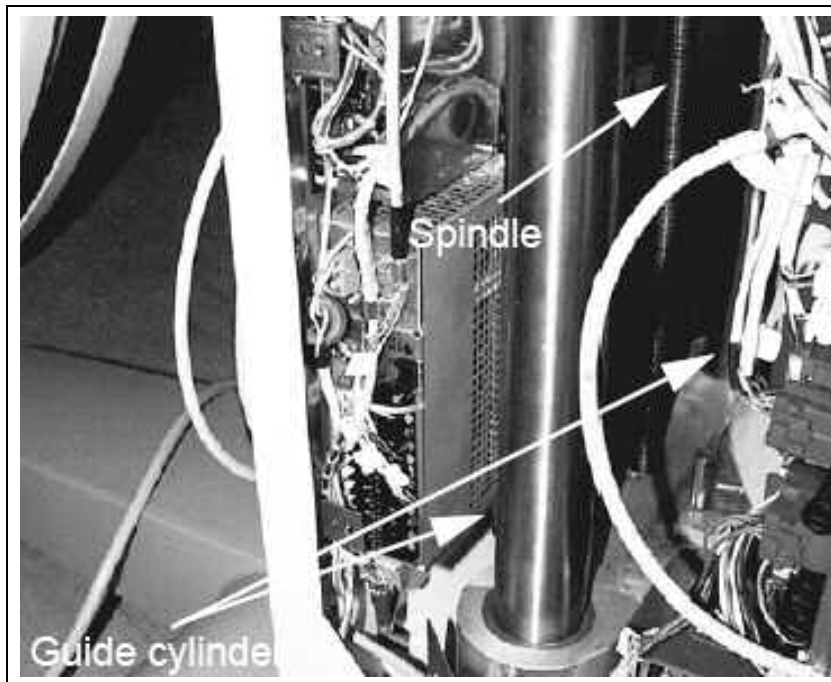


Fig. 62: Spindle

1. Grease the guide cylinders with approximately 5 - 10 ml of "Slick Pac PTFE" special bearing grease.
2. Then move the lifting column through the entire travel range twice to ensure that the grease is evenly distributed.

WARNING**X-ray radiation!****If ignored, death or serious physical injury can occur.****⇒ Protect yourself from radiation! Wear a lead apron!****NOTE**

When measuring the tube current, the voltage divider current must be subtracted from the measured value. The voltage divider current depends upon the kV and is calculated according to Ohm's law. The voltage divider resistance is 400 MOhm.



- Switch the system off.
- On board D21, set switch S3 to ON.
- Connect the mA measuring instrument to D21.X121 MAS+ and MAS-.
- Switch the system on.
- The total current can be read off during radiation.
- Read the kV value that results while measuring the current.

The tube current can now be calculated:

Tube current [mA] =

= total current [mA] – (High voltage [kV] : Volt. divider resistance [MOhm])

e.g.:

A total current of 5.275 mA is measured at 110 kV.

- After the measurement, set switch S3 on D21 back to OFF.

WARNING**X-ray radiation!****If ignored, death or serious physical injury can occur.****⇒ Protect yourself from radiation! Wear a lead apron!****NOTE**

When measuring the tube current, the voltage divider current must be subtracted from the measured value. The voltage divider current depends upon the kV and is calculated according to Ohm's law. The voltage divider resistance is 400 MOhm.



- Switch the system off.
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- Connect the mA measuring instrument to D21.X121 MAS+ and MAS-.
- Switch the system on.

- The total current can be read off during radiation.
- Read the kV value that results while measuring the current.

The tube current can now be calculated:

$$\text{Tube current [mA]} = \text{total current [mA]} - \frac{\text{High voltage [kV]}}{\text{Volt. divider resistance [M}\Omega\text{]}}$$

$$\text{Tube current [mA]} = 5.275 \text{ [mA]} - \frac{110 \text{ [kV]}}{400 \text{ [M}\Omega\text{]}} = 5.275 \text{ [mA]} - 0.275 \text{ [mA]} = 5.0 \text{ mA}$$

e.g.:

A total current of 5.275 mA is measured at 110 kV.

- After the measurement, set switch S3 on D21 back to OFF.

Safety Information revised.

Safety notes regarding optional navigation systems added

Description for Spellman I.I: Mini power supply added.

Description for MGE UPS Type 800 battery exchange revised

Description for MGE UPS Type 850 battery exchange added.